Chemical Age

VOL. 77 No. 1959

26 January 1957

Packaging Exhibition

(See page 155)

"Fluor acid air is procured by dissolving the earthy substance called fluor in vitriolic acid.
This kind of air extinguishes a candle and, like vitriolic air, one measure of it saturates two of alkaline air. It is peculiar to this kind of air to dissolve glass when it is hot.
It seems to consist of a peculiar acid vapour, united to the strong substance of the fluor; for water being admitted to it absorbs the acid vapour, and the stony substance is deposited. By this means it exhibits an amusing appearance, whether water be admitted to a glass jar previously filled with that air, or the bubbles of air be admitted, as they are formed, to a quantity of water resting on mercury."

INDEX TO ADVERTISERS

The first figures refer to advertisement in **The Chemical Age Year Book**, *the second to the current issue*

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CHEMICAL AGE

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ATOMIC POWER

DEMAND for uranium metal for nuclear power production is increasing rapidly. It is also obvious that the early estimated quantities for this purpose are likely to be very much greater now that so many atomic power plants are envisaged. There is, too, the military demand for uranium metal which has recently been estimated, very conservatively it is felt, at between 10,000 and 15,000 tons a year.

Uranium is widespread in the earth's crust in an amount estimated at 0.0003 per cent. Fortunately it also occurs in more highly concentrated deposits for extraction economically. The other element which can be used as an atomic fuel is thorium. It is three or four times more abundant than uranium and much more accessible, but it tends to occur less frequently in deposits of uniform grade.

However, at a recent meeting of the American Nuclear Society in Washington, a commercially feasible method of extracting thorium from the sand in which it is found, was reported. The method was developed on 'slurries' of monazite sand sent to the US Atomic Energy Commission's Oak Ridge National Laboratory by Brazilian processors. The material, of a treacly consistency, averaged 39 per cent thorium by weight and according to an AEC spokesman, virtually all the thorium was recoverable by a chemical process developed at Oak Ridge.

Some scientists consider thorium and plutonium (another possible atomic material) the two best fuels for the breeder type of reactors. However, as there is more than 10 years' background information on uranium, metallurgists appear to be reluctant to change over to the relatively unknown thorium.

Present supplies of uranium to the UK all come from abroad and are purchased through the Combined Development Agency (an organisation set up by the UK, the US and Canada). It is obvious that uranium production has been accelerated recently and undoubtedly the increase in production will give rise to new conditions of supply and demand, so that it seems certain that uranium will enter the world's markets even though its exports will remain restricted.

It has recenty been claimed that within the next few months Canada will overtake the US to become the largest producer of uranium in the free world, processing nearly five million tons of uranium ore, to produce 4,000 tons of uranium metal, and thus far exceeding the total production of the rest of the world. It has also been estimated that by 1958 Canada will be producing about half the 1958 free world production of uranium (something of the order of 12,500 tons of pure uranium metal).

Until last week security shrouded the uranium mines' operations in South Africa. Now it has been unofficially forecast that the Union's annual production of uranium oxide has reached 4,500 tons annually, which would be equivalent to about 3,300 tons of uranium metal and a figure which would make that Dominion easily the largest world producer of the metal. (The US has up to now been considered the largest producer with an output of 3 million tons of ore, or about 2,500 tons of uranium metal.)

In page 167 will be found statements by the chairman of the South African uranium producing companies. Australian production of uranium is also going ahead, although according to present geological and prospecting indications, Australia can never become one of the major uranium producers. However, it is considered that it will certainly be among the first five or six major uranium producing countries within the next three years.

South America is a potential major source of uranium and recently it has been considered that this continent might draw equal with the US in 1957 as a uranium producer. In any case, Brazil has the largest known thorium deposits.

With regard to uranium production in Russia and the satellite countries, it is estimated, that these produce between 3,000 and 4,000 tons of purified uranium metal. As far as can be ascertained, Russia's production of uranium is increasing rapidly and it is considered that with the progress of production in the new areas of the Yenesei and Kamchatka and the intensification of production in the Ferghana region of Southern Central Siberia, Russia's output of uranium metal by the end of 1958, or beginning of 1959, will reach a figure of about 10,000 tons.

SOUTH AFRICAN URANIUM

RECENTLY the chairman of the Atomic Energy Board granted permission for the publication of information relating to the size of uranium ore reserves, the grade of ore involved and output figures concerning the metal since 1 July 1956. Until now, the mines have only been allowed to announce net profits and even now a ban remains on the disclosure of the price received for the product and production costs.

The Rand December quarterly reports which have just appeared give uranium statistics along the permitted lines. Primarily the South African mines are gold producers and uranium production at the mines whose reefs carry the metal has been financed by loans from the Atomic Energy Board.

The contract with the Atomic Energy Board provides for the sale of uranium over a period of ten years commencing when full production starts. Price received by the companies for the uranium produced is related to cost on a basis that ensures redemption of capital costs of the extraction plant and equipment, together with interest.

Traditionally, South African mines announce their results in terms of pennyweights per ton of ore and the width of the reef in inches. Multiplying these two, the unit 'inch-dwt' is arrived at. Although this unit has limitations it has proved of value for comparative purposes. In any event, this practice has been applied to uranium, although since uranium values are not expressed in pennyweights but in pounds of metal oxide per ton of ore, a new unit has been introduced—an 'inch-lb.'

From the information so far available it is obvious that deposits of uranium in the various reefs being worked vary widely from mine to mine and from point to point in any given mine.

It is considered there may be some difficulty in relating uranium development values with results of actual recoveries from treatment plants. This may be due to the narrowness of the reefs so that much waste rock must be mined in order to reach the ore-bearing reef.

PLASTICS AND WATER SUPPLY

AS will have been noted in last week's issue of the CHEMICAL AGE (P.123) certain standards have been laid down by German municipal authorities for plastics pipes used to distribute drinking water. On the Continent, plastics pipes, particularly of p.v.c. (polyvinylchloride), are well known to water undertakings. In the UK, pipes made from p.v.c. are less common, the best known plastics pipes here being of polythene.

Processes at present in use, or which will shortly be in use, for the production of polythene are the original high pressure process developed by Imperial Chemical Industries Ltd., from 1933, the Phillips process developed in the US about 1954 and the Ziegler low pressure catalyst process developed in Germany, also about 1954. All three methods produce a variety of grades of polythene. These grades are of increasing molecular chain length which when compared at the same temperature, give an increased density, a higher softening temperature and an increased brittleness.

In the manufacture of plastics pipe, the polymer may be mixed, either in the form of a dry powder or in small granules, with a stabiliser to retard scorching and consequent loss of strength of the polymer during the heating period of extrusion. A stabiliser, however, is not required for polythene. To retard slow degradation of the plastic when exposed to sunlight or air an antioxidant is incorporated, and for the same purpose, carbon black. A lubricant is used to prevent sticking of the plastics material to the walls of the die during extrusion and a plasticiser to soften and toughen the plastic at low temperatures.

For beer hose and garden hose, plasticised p.v.c. is used, but as the plasticiser is usually a relatively low molecular weight compound, it is gradually leached out of the hose, which then becomes brittle and useless. For water supply purposes, p.v.c. is extruded without a plasticiser—unplasticised or rigid p.v.c. This plastics material has a tendency to be 'glass-hard' at normal temperatures and can fracture on the line of surface scratches. The inclusion of small amounts of compatible synthetic rubbers during p.v.c. manufacture eliminates thus. The rubber is not leached out of rubber modified rigid p.v.c. and this plastics material is termed unplasticised.

A variety of plastics may be extruded in pipe form. Only some are commercially available and can be used in water undertakings. According to the UK Water Research Association, possible plastics pipes materials are rubber modified polystyrene (styrene butadiene copolymer) polyamide (nylon) and cellulose acetate butyrate.

From the US comes news that a stabilised low pressure polythene is being sought for pressure pipe. It is suggested that this may be obtained by varying the polymerisation process and adding a stabiliser. Blending low and high pressure types has not been successful according to *Chem. Engng. News, 1957*, **35**, *No. 1.*

The US Carbide and Carbon Company is reported to have run laboratory tests on low pressure polythene pipes (process Ziegler and Phillips) which show that cracking is not a problem. These pipes have not been field-tested, however. The Hercules Powder Company considers that its product Hi-Fax 1800, one of its linear polythenes made by the Ziegler process, will equal conventional polythene pipe when manufactured at 60 per cent of the wall thickness of conventional polythene.

It is interesting to note that according to Phillips Chemical Company, all highly crystalline linear polythenes are subject to certain limitations in applications, as are all thermoplastics, including those resulting from long-term stress-cracking. The company reports, however, that its Marlex polyolefins provide a balance of properties, including improved resistance to stress-cracking. The Phillips process is used by this company.

PACKAGING FOR CHEMICALS

London Exhibition Features Many New Developments

THE Packaging Exhibition was opened by Lord Brabazon of Tara at Olympia, London, on Tuesday, 22 January. Remaining open until 1 February, the exhibition is the largest yet staged. Over 200 exhibitors are taking part.

A Packaging Convention, organised by the Institute of Packaging, is being held concurrently with the Exhibition. The theme of the Convention is 'Better Packaging Means Better Living.'

A new snap plug polythene closure for use on vials holding either solids or liquids is featured on the stand of **The Anchor Glass Co. Ltd.**, Brent Cross Works, North Circular Road, London NW2. The closure is lightweight and easy to handle and does not take up any appreciable space inside the container. Unlike most polythene closures, this closure has been specially designed to hold liquids.

The display also includes tablet, capsule, powder and liquid containers; serum, injection and antibiotic vials; pipettes, droppers; ampoules; vials complete with polythene closures; screw-neck vials; test tubes with screw and controlled necks and rimmed or rimless; flat bottom tubes; atomisers; cartridge tubes; glass containers of all types; containers and other glassware for the pharmaceutical and allied trades; and glassware made to specification for all purposes.

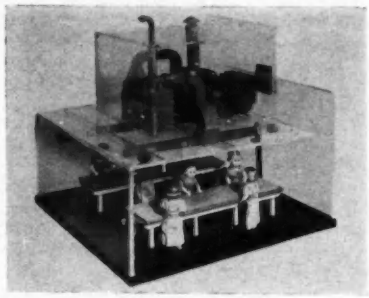
Anglo-American Plastics Ltd., of 1 Avery Row, Grosvenor Street, London W1, extrudes, converts and prints polythene layflat tubing and sheet film. These products are marketed under the trade name Fablothene. The exhibit consists of these products and various examples of products packed in them to illustrate their use. The materials shown are both plain and printed in one, two and three colours. Also exhibited are examples to illustrate the lamination of Fabrothene to other materials.

The company's associate, **Commercial Plastics Ltd.**, is exhibiting p.v.c. sheeting and bags. Rigid plastics sheet of high impact and tensile strength for vacuum forming is being exhibited, illustrating its potentialities for the manufacture of rigid container and display units.

To emphasise the importance of a dry atmosphere in preserving wrapped and packaged products, the stand of the Dryer Division of **Birlec Ltd.**, Tyburn Road, Erdington, Birmingham 24, features a life size animated weather gauge in which the dry figure is an Egyptian mummy case. Behind the weather gauge is a large glass panelled room fully air conditioned by means of a Birlec Lectrodryer Direct Dehumidifier (Model CHE). Such equipment is said to be ideal for air conditioning in plant where moisture sensitive components or products are required to be packed.

To illustrate a typical air conditioning installation a newly constructed model is on show. Air withdrawn from the work room is dried in the Birlec Direct Dehumidifier and then returned to the enclosure.

Standard Birlec equipment for maintaining relative humidities between 50 per cent and one per cent is available in various capacities capable of handling air flows ranging from 100 to 15,000 cu. ft. per min. These flows are respectively typical for rooms housing single occupants and for large premises housing several hundred operators at work on extensive manufacturing plant.



Model of a typical Birlec air conditioning installation showing layout for air conditioning

The packaging division of **Bowater Sales Co. Ltd.**, Bowater House, Stratton Street, London W1, is showing a range of pasted and sewn multiwall sacks. Latest addition to the range is the 5½ in. pasted valve sack which, used in conjunction with specially-designed Bowater sack fillers, is said to give greatly increased efficiency. These sack fillers (Models 5007 and 3003) are shown, together with the standard and portable models of the Union special sewing head.

Drums for hazardous powders such as dyestuffs are also on show. Of particular interest is the improved Supakask featuring a new base which gives increased protection against moisture. Rim of base, rim of cylinder wall and locking ring are now galvanised.

New developments in animal glues are stressed by **British Glues and Chemicals Ltd.**, Imperial House, 15-19 Kingsway, London WC2. Jelly glues, powder glues and pearl glues are shown. The display is mainly educational, with the object of emphasising the versatility of animal glues in the packaging industry. A range of adhesives for carton sealing, box covering, envelope making, carrier bags, spiral tubes, laminated board, paper coating, gumming and bookbinding is available.

Some of the qualities of Visqueen film are illustrated on the stand of **British Visqueen Ltd.**, Six Hills Way, Stevenage, Herts. The exhibit, which is principally of a pictorial nature, emphasises such properties of the film as its toughness, transparency, printability, mechanical strength and flexibility at low temperatures. The high resistance of the film to chemicals as well as its waterproofing qualities is stressed.

The use of Visqueen in liners for drums, sacks and kegs for the packaging of chemicals and allied products is shown.

Exhibits of **Electronic Machine Co.**, Mayday Road, Thornton Heath, Surrey, include automation and electronic control equipment, electronic batchcounting machines for small parts, electronic photocell counters, electronic control units, process timers, colour control equipment, electronic registration equipment, electronic sorting equipment, machine safeguarding equipment and conveyor control equipment.

A wide range of Skylon polythene bottles, jars and containers, from five c.c. to 13 gallon capacity is being shown by **Fibrenyle Ltd.**, 157 Dukes Road, Western Avenue, London W3. These have fitments and dispensers covering most requirements for liquids, creams and powders.

A wide range of glass containers used in the food, drink, chemical, medical and pharmaceutical industries is exhibited by the **Glass Manufacturers' Federation** (Container Section), 19 Portland Place, London W1. The display is designed to emphasise the natural advantages of glass as a packaging material.

Electronic metal detection equipment, for the location of metallic contaminations, both ferrous and non-ferrous, in non-metallic media is being exhibited by **Goring Kerr Ltd.**, Station Road, Gerrards Cross, Bucks. Applications of the equipment include most foodstuffs and confectionery, chemicals and pharmaceuticals, timber and paper, plastics, rubber, textiles, surgical dressings, animal foods, soap, clay, coal, cement, etc. The latest standard model has increased sensitivity and a double setting feature which is said to allow optimum results to be obtained from wet or dry products, and from many conductive products previously difficult to inspect.

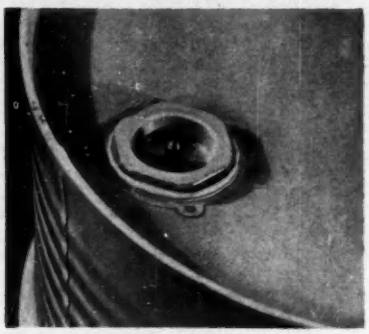
Each equipment consists of a search head, through which the products to be examined are passed, and a control unit. When metal enters the search head an alarm is operated, and the faulty section of production may be diverted automatically, marked, or the conveyor made to stop.

The latest small aperture model (SJM) is also shown. It is believed to be the smallest and cheapest equipment of its type made. No setting-up is required. Once installed the equipment will, it is claimed, operate indefinitely without further attention.

Hy-Tra-Lec weighing and filling machines and check-weighing machines are featured on the stand of **Industrial Products (Speco) Ltd.**, New Grove Man-

PACKAGING FOR CHEMICALS

sions, 7 Boston Manor Road, Brentford, Middlesex. High-speed automatic weighing and filling of free-flowing dry products in weight ranges ½ to 2½ oz., one to four oz., and two to eight oz. is being



The recently developed vacuum drum fitting which vacuumises the container after filling. By Reads Ltd.

shown together with check-weighers for incorporation in packaging flow lines to check packs in weight ranges one to four oz., two to eight oz., eight to 18 oz., and 16 to 32 oz.

Being shown for the first time by **Manesty Machines Ltd.**, of Evans Road, Speke, Liverpool 19, is the Manesty Fitz-Mill comminutor, a high speed machine for wet and dry granulating, pulverising, dispersion or wetting, milling of ointments and sizing of crude drugs. Other exhibits include the Manesty DryCota combined tablet making and compression coating machine, developed for the coating of tablets by compression instead of by the earlier method of coating in a revolving pan. On this machine both the core and the coated tablet are produced simultaneously. Advantages of this are said to be that materials affected by moisture can now be coated and two-stage medicaments can be used. The finished tablet can also be engraved or embossed.

A range of steel drums and kegs and composite containers for use with a variety of products is being displayed by **Metal Containers Ltd.**, Seymour House, 17 Waterloo Place, Pall Mall, London SW1. This includes liquid drums from two to 90 gallons capacity and open-end drums from two to 50 gallons capacity. The display also includes a general variety of filling holes and closures, composite containers, plastic lined drums, internally coated drums and stainless steel casks.

Aluminium alloy and stainless steel drums used for transporting a wide range of chemicals are displayed by **E. C. Payter and Co. Ltd.**, Limerick Works, Meeting Street, Great Bridge, Tipton, Staffs. Said to offer high resistance to corrosive attack, the drums have an extended life, making them an economical package. They are manufactured in sizes ranging from five to 90 gallons.

A range of tin boxes, steel, aluminium and lined drums, and other metal containers used in the chemical industry are shown by **Reads Ltd.**, Orrell House, Orrell Lane, Walton, Liverpool 9. Some of the special closures being shown are FlexSpout plastic necks; RingSeal temper-proof fittings and ViseGrip pressed-steel bungs. Of particular interest is the recently developed vacuum drum which incorporates a special valve fitting for vacuumising the container after filling.

Roberts' Patent Filling Machine Co. Ltd., of Deane Road, Bolton, Lancs, is exhibiting new types of liquid filling machines which automatically tare and fill a correct net weight in the drums. Two sizes of machine are on view, one for five to 10 gallon drums and the other for 20 to 45 gallon drums. These machines are said to be ideal for the filling of oil and chemical products.

Other exhibits include a single unit filling machine for submerged filling of frothy products in five to 10 gallon drums, a machine for filling tins of paint, and an automatic bottle filling machine.

A new high speed strainer is featured on the stand of **Russell Constructions Ltd.**, Russell House, Adam Street, Adelphi, London WC2. Easily erected or dismantled the net weight of the machine is three cwt. and in operation is suspended by means of a hook which can be attached to a girder. The height is approximately 51 in. and the maximum diameter 33 in. The machine can be installed in a minimum of space and in operation will run continuously without undue attention.

Its balanced mechanism is said to eliminate vibration at the point of suspension although the machine is in itself a vibrating unit. This vibration when the machine is in operation imparts an appearance to the screen of a photograph taken out of focus. This highly perceptible gyration of the screen is accompanied by almost silent running.

The unit is powered by a ¾ h.p. electric motor which at 400/440 volt, three phase, 50 cycle, consumes only 1.2 amps. Optimum speed is 2,750-2,850 r.p.m.

The Solartron Electronic Group Ltd., Solartron Works, Queens Road, Thames Ditton, Surrey, has now commenced production of Board of Trade approved high speed electronic check weighers. Included in the range is a versatile portable check weigher and a fully automatic console model incorporating selective channelling of correct, over and under weight products, all of which will weigh up to 120 items per minute. An electronically-controlled paper cutter, for wrapping machines etc., is also on show.

A fully automatic synchronised mixing set is featured on the stand of **Southall and Smith Ltd.**, Villa Street Works, Hockley, Birmingham 19. Two, three, four or more machines are linked mechanically and electrically for synchronised discharge, the number being determined by the different ingredients to be handled and the machine size by the proportion of each constituent in the final mix. After the individual feed hoppers have been charged with the bulk supply, small pre-determined weighings are simultaneously discharged from each machine several times each minute. Should one weigher stop delivering from any cause the complete unit stops at once. If the contents of one of the hoppers run low a warning light appears to allow fresh supplies to be delivered without interfering with production. These units can be arranged to operate with pumps and other types of liquid measuring devices such as are used in the manufacture of pastes and creams.

A large-scale diagrammatic model of wax refining, on the stand of **Whitehead Chemical Co. (Waxes) Ltd.**, St. Andrews House, 62 Bridge Street, Manchester 3, showing the methods of extraction from crude oils to refined waxes shows the origin of the basic waxes used in the packaging industry. Converted materials such as wax coatings, laminations, heat seals, etc., of paper, foil, and board, illustrating the use of specially compounded waxes are on view together with samples of each type of wax used. Methods of technical control applied in the manufacture of these waxes are also illustrated.

Conservancy Authority for Milford Haven

THE GOVERNMENT is to set up a conservancy authority in connection with the development of Milford Haven as a port for large tankers and ore carriers. The Minister of Transport, Mr. Harold Watkinson, announced this on 16 January to a meeting of representatives of Milford Docks, British Petroleum, Esso Petroleum and other organisations.

Esso has proposed a five million ton a year refinery to cost £20 million and to be completed by 1960. BP is constructing a tanker terminal and a 60 mile pipeline at a cost of £5 million to feed its refinery at Llandarcy. The BP project, it is hoped, will be finished by the end of 1959.

Both Esso and BP have prepared schemes for Milford Haven because of the need to provide berthing accommodation for super-tankers of up to 100,000 tons.

Work Begins at Bradwell

Work began on 18 January at the Bradwell, Essex, 300 megawatt nuclear power station which is being built by the Nuclear Power Co. The Bradwell station is one of the first two commercial nuclear power stations to be built in the world. The other one is at Berkeley in Gloucestershire, where work began on 7 January.

Instrument Exhibition

Electronic instruments and controls were shown at an exhibition held at Stephenson Place, Birmingham, on 22, 23 and 24 January. Organisers of the exhibition were A. M. Lock and Co. Ltd., who are sole Midlands sales and service representatives for Elcontrol Ltd., W. G. Pye and Co. Ltd., Black Automatic Controls Ltd., West Instruments Ltd. and Loma Metal Detectors.

OCCA Conference on Catalytic Processes and Surface Coating

A CONFERENCE on 'Catalytic Processes Relating to the Surface-Coating Industries' will be held by the Oil and Colour Chemists' Association at Torquay from 21 to 25 May.

The following papers will be presented: 'Cationic Polymerisations' by Professor D. D. Eley, 'The Reactions of Hydrocarbon Radicles on Metal Surfaces' by Dr. G. C. Bond, 'The Role of Peroxide Catalysts in Coating Compositions' by Professor C. E. H. Bawn, 'The Manufacture of Paint and Lacquer Solvents from Petroleum' by F. E. Hixon, 'Dryer Catalysts' by C. T. Morley-Smith, 'The Influence of Salts and Acids on the Metal Soap Catalysed Drying of Lithographic Varnishes and Inks' by R. R. Coupe. Professor F. S. Dainton and Dr. D. F. Rushman will also deliver papers, the titles of which are to be announced.

Non-members of the association wishing to obtain registration forms and other information should write to the general secretary of the association at Memorial Hall, Farringdon Street, London EC4.

BS on Assessment of Aerial Bactericides

A BRITISH STANDARD Technique for the preliminary assessment of aerial bactericides (BS. 2796: 1956) has been issued. It is intended as a method of determining whether a product is suitable for further investigation as an aerial bactericide, but it will also be found useful by manufacturers of such products for quality control.

Characteristics of the technique specified are, capacity of the test chamber, temperature and relative humidity during the test, test organism and ingredients for a broth medium. Requirements for taking a series of samples are included together with the method of producing the bacterial spray and the special apparatus for the purpose. The method of interpreting the results is also given.

A reference bactericide is specified and a method given for its use for checking the technique of the test.

Copies of BS 2796 can be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London W1. price 3s 6d.

Chemical Exports for December

Total exports of chemicals from the UK in December 1956 were valued at £19,482,913, slightly less than the figures for the previous December (£19,655,602). Figures for the year ended 31 December 1956 are, however, slightly up on the previous year, £244,526,579 compared with £233,049,513. The figure for 1954 was £203,995,201.

Australia was the largest importer for December at £1,246,270, with India second at £935,723. Other large importers were South Africa (£892,317), France (£817,292) and Sweden (£758,832).

COAL CHEMISTRY AND THE CARBONISATION INDUSTRY

Institute of Fuel Paper by Dr. Dryden

IN A PAPER entitled 'Chemistry of Coal and its Relation to Coal Carbonisation' presented to The Institute of Fuel on Wednesday, 23 January 1957, at the Institute of Civil Engineers, London SW1, Dr. I. G. C. Dryden attempted to evaluate quantitatively the relations between the chemical constitution of coals and their behaviour when pyrolysed. The author hoped to bridge partly the gap between fundamental research and practical aspects of carbonisation processes and to indicate the most fruitful lines of research.

Present knowledge of chemical constitution and physical structure of coals was outlined and the factors likely to influence the yield and nature of the products of coal pyrolysis were discussed.

Three new concepts—carbon, hydrogen and oxygen in volatile matter—have been used to throw light on the mechanisms by which volatiles are formed during heating.

The author reported that the quantity of molecular hydrogen at the higher temperatures is affected markedly by the amount to secondary cracking (of tars etc.) and therefore by the type of assay or plant used.

Volatile Matter

Evidence for the origin of volatile matter was considered by Dryden, and the various hypothesis put forward were discussed. He reported that aromatic carbon contained in the volatile matter is, in fact, considerable, i.e., over the 'bituminous range 12 to 8 per cent of the weight of coal at 500°C and about 9 per cent of the coal at 900°C.

In considering uses of coals in relation to their fundamental properties, Dryden stated that the properties that determine the best use for a given coal are calorific value, power of softening and agglomerating on heating, and the yields of carbonisation products. High rank coals such as steam coals and anthracites yield the greatest heat and the smallest amounts of volatile products. Good yields of gas and tar are obtained from coals of middle rank (from 85 to 90 per cent carbon content or 35 to 25 per cent VM). Best coals for gas making are limited to the lower part of this range because the yields of gas and tar reach a maximum. At still lower ranks the gas yield falls slightly, although that of tar continues to increase owing to the small size of aromatic nuclei and the increased content of aliphatic groups. Below 87 per cent carbon content, the tar yield rises more rapidly than that of gaseous hydrocarbons. The yield of hydrogen decreases with rank throughout the range, possibly, it is thought, in some relation to the decrease of aromatic hydrogen in the coal. Yields of char or coke fall continuously with rank decrease—therefore higher rank coals are best for coke making.

The variation, as temperature is increased, of hydrogen in tar with hydrogen in hydrocarbons and molecular hydrogen was illustrated. The yield of molecular hydrogen is considered to be derived from the solid residue rather than from secondary cracking of tar.

Of interest is a new equation linking standard VM with carbon and hydrogen contents. This investigation is still at an early stage, but the following preliminary conclusions are stated: (1) the combined water and tar yield is in good agreement with that expected from the hydroxyl content of coals, and it may be possible to increase the tar yield many times at the expense of water providing suitable methods are found; (2) on stoichiometric grounds there is a margin for increasing tar yield, although detailed chemical structure limits this possibility especially with high rank coals; (3) industrial yields of gas are close to those stoichiometrically possible; (4) there is a considerable margin for either increasing or decreasing coke yield from a given coal; (5) a substantial proportion (10 to 20 per cent) of the aromatic structures in coal are evolved during pyrolysis—although this proportion decreases with increases in rank—as well as aliphatic structures; (6) the mechanism of thermal decomposition appears to be basically the same for all coals in the bituminous range.

Liquid Pitch Used as Fuel

In Belgium, the Schelle power station situated 20 miles from Antwerp, now receives liquid pitch delivered hot to avoid solidification. The pitch is obtained from the Antwerp refinery of the Société Industrielle Belge des Petroles. The steam generating section of the refinery is itself using the same fuel.

As the pitch sets to hard lumps at normal temperatures, it is taken hot from the refinery (320°F) and kept hot up to the moment of combustion. Three specially equipped barges are used with heat-insulated tanks. Reheating has not been required since the maximum temperature loss during loading, travel and discharge (about five hours) has proved to be no more than 5½ degrees.

The Schelle station was originally designed to use powdered coal. The coal-burning equipment has not been disturbed. Six pitch burners have been set in the back wall of the combustion chamber.

£500 a Year for Leeds

The Dunlop Rubber Co. are contributing £500 a year for seven years in response to the appeal for funds for the expansion of the University of Leeds.

Chemical Output in 1956 was Up by Three Per Cent

AVERAGE output of the chemical and allied industries during the first eight months of 1956 increased by 82 per cent compared with an increase of 38 per cent for all manufacturing industry, taking 1948 as the base year. While the all-industry figure represented a drop of 4 per cent on 1955, the result for the chemical industry was 3 per cent greater.

This was stated in the annual report of the chemical and allied trades section, Manchester Chamber of Commerce. The increase for chemicals was smaller than the increases achieved in previous years; the outlook for the chemical and allied industries remains, it is stated, full of promise.

Exports of chemicals in 1956 were again a record and during the first 10 months they reached £202.5 million, an increase of almost 5 per cent compared with the same period of 1955. India, increasing her purchases from £13.8 million to £15.4 million took over the role of principal market from Australia, whose imports fell from £16.2 million to £14.7 million.

Shipments of chemicals to the US continued to increase, the rise for the 10 months' period of 1956 over the comparable 1955 period being 14 per cent. The respective values were £7.3 million and £6.4 million. In view of the proposal to create a European common market, it is interesting to note that UK exports to the six Messina countries totalled £30.9 million, against £26.1

The section committee hopes that no final commitment on a common market will be taken until the Government has published and invited industrial comment on a White Paper outlining the scope and implications of the plan.

The report notes, for the first time in many years, a reduction in the value of chemical imports. For the first 10 months of last year, imports totalled £91.2 million, £2.2 million less than in the previous year.

Reporting on various sections of the chemical industry the section says that there was a significant drop in dyestuffs production from the 1955 level, although this had improved towards the end of the year.

The value of pharmaceutical exports remained steady and trade on the home market continued at the same level with some change in pattern.

In lubricating oils and greases, the earlier part of 1956 recorded satisfactory progress and tranquil trading. The pattern of trade was, however, disturbed by recent Middle East events.

Supply and demand of farinaceous products followed much the same pattern as in 1956 and there was a general firming in all prices.

SCOTTISH SAC TO HOLD CONGRESS ON MODERN ANALYTICAL METHODS

MODERN analytical chemistry in industry is the subject of a congress which, organised by the Scottish Section, Society for Analytical Chemistry, will be held at the University of St. Andrews from 24 to 28 June. An exhibition of modern analytical apparatus and reagents will be held at the same time.

Lectures and discussions fall into three main groups: analysis in modern industry; application of some newer analytical techniques in industry; developments in analysis for new problems in industry. Each group will be preceded by a congress lecture: 'Analytical Chemistry in Industry' by Dr. James Craik, chairman ICI Nobel Division; 'Analysis and Food' by Dr. L. H. Lampitt, director and chief chemist, J. Lyons and Co. Ltd.; 'New Analytical Reagents and Their Applications in Industrial Plant Control Operation' by Professor G. F. Smith, University of Illinois.

Chairman of the congress will be Dr. Magnus Pyke (The Distillers Co., Ltd.), Scottish Section chairman. Session chairmen will include Professor D. H. R. Barton, Dr. R. Belcher, Professor E. L. Hirst, Dr. H. W. Melville, Dr. D. Traill and Dr. C. L. Wilson.

Papers will be given by the following: B. Bagshawe (Brown Firth and Co.), Dr. G. C. Barker, G. W. C. Milner and H. Halgosky (UK Atomic Energy Authority), Dr. G M. Bennett (Government chemist), Dr. B. W. Bradford (ICI Billingham Division), R. C. Chirnside (GEC), Dr. G. R. Davies (Chemical Research Laboratory), Professor C. F. Davidson (St. Andrews University), A. B. Densham and G. Gough (North Thames Gas Board), Dr. D. C. Garratt (Boots), Dr. J. Haslam (ICI Plastics Division), Dr. H. M. N. H. Irving (Oxford University), Dr. A. T. James (Medical Research Council), Dr. A. I. M. Keulemans (Koninklijke Shell Laboratory), D. Manterfield (Steel Peech and Tozer), Dr. A. E. Martin (Sir Howard Grubb, Parsons and Co.), M. Milbourn (ICI Metals Division), D. A. Patient (Baird and Tatlock), A. R. Powell (Johnson Matthey and Co.), A. A. Smales (UK Atomic Energy Authority), Dr. R. L. M. Synge (Nobel Laureate, Rowatt Research Institute), A. F. Williams (ICI Nobel Division).

Accommodation will be provided in University residences at a full period fee of £7 7s. Registration fee for members will be £2 12s 6d and £3 13s 6d for non members.

Registration forms should be returned to the congress secretary, Mr. J. A. Eggleston, divisional analyst, Boots Pure Drug Co. Ltd., Airdrie Works, Airdrie, Lanarks, by 31 May.

Chemical Engineer is Chairman of New Committee on Synthetic Detergents

MR. H. W. CREMER, a partner in the firm of Cremer and Brearley, consulting chemical engineers, London, is the chairman of a new standing technical committee on synthetic detergents, set up by the Minister of Housing.

Task of the committee is to keep under review the difficulties, or risks of difficulty, arising in sewage works, rivers and water supply as a result of the use of synthetic detergents; and to encourage and assist the co-ordination of, appropriate research by detergent manufacturers and intermediate materials and by suitable public organisations, into methods by which those difficulties could, without an undue burden on public funds be avoided or overcome.

The committee will report progress to the Minister at least once a year.

Committee members are: Dr. N. R. Beattie, principal medical officer, Ministry of Health; Dr. E. A. B. Birse, chief inspector of alkali works and rivers pollution in Scotland; Dr. A. H. Cook, assistant director, Brewing Industry Research Foundation; Mr. H. R. Galleymore, head of research and development, Thomas Hedley and Co. Ltd.; Mr. W. E. Hamer, general research manager, Monsanto Chemicals Ltd.; Dr. G. C. Hampson, research manager, Unilever Ltd., Port Sunlight; Dr. S. H. Jenkins, chief chemist, Birmingham Tame and Rea District Drainage Board; Dr. A. Key, senior chemical inspector, Ministry of Housing; Dr. J. Longwell, senior principal scientific officer, Department of the Government Chemist; Mr. F. T. K. Pentelow, chief inspector of salmon and freshwater fisheries, Ministry of Agriculture; Dr. B. A. Southgate, director of water pollution research, DSIR; Mr. R. C. Tarring, manager of detergents department, Shell Chemicals Ltd.; Dr. E. Windle Taylor, director of water examination, Metropolitan Water Board.

Secretary of the new committee is Mr. D. H. A. Price, of the Ministry of Housing.

Borax Open New Lab. at Tolworth

RESEARCH Laboratories at Tolworth, Surrey, have been acquired by Borax Consolidated Ltd., operating subsidiary of Borax (Holdings) Ltd., to provide facilities for a staff of 50 chemists or more.

Before 1 January, when the move to Tolworth was completed, research was carried out in the relatively small laboratories at Borax House, Carlisle Place, London SW1. The new laboratories, together with those at Belvedere, Kent, provide room for a greatly expanded programme of research in boron chemistry and in other fields.

Change of Name

The Animal Medicine Manufacturers' Association has changed its name to Associated Manufacturers of Veterinary & Agricultural Products.

EYE INJURIES IN CHEMICAL WORKS—2

Prevention and Methods of Treatment

By K. P. Whitehead, M.R.C.S., L.R.C.P.

FACTORS influencing the severity of eye injuries caused by chemicals acting externally are:

(1) *Amount, concentration and duration of exposure* Chemicals may enter the eye in the form of solids, liquids, gases, dusts or smokes and it is obvious that a greater amount, and frequently a higher concentration, will enter the eye if the chemical is in solid form or in liquid form than if it is in the form of gas, dust or smoke. Moreover, once solid or liquid has entered the eye it will stay there until somebody removes it, whereas with a vapour the exposure to the chemical ceases when the patient removes himself from contact with the vapour.

Vapours frequently produce a sensory warning in the form of smell or early painful irritation of the eye long before serious damage is done. An example of this is ammonia, which has a characteristic choking smell and rapidly produces painful spasms of the eyes and a free flow of tears. A person exposed to such vapour is therefore not likely to sustain a severe injury as he will rapidly remove himself from the irritating smell, his eyes will close with the spasm and a free flow of tears will wash away what little vapour has entered. If, on the other hand, ammonia liquid enters the eye, although it is certainly diluted by the flow of tears, it remains to continue its injurious action until removed by adequate treatment. A warning note should be mentioned, for certain individuals quickly develop a tolerance to the irritating effects of such chemicals as ammonia and the workman who is continually exposed to mild concentrations of ammonia soon overcomes his unpleasant lid spasm and hardly notices the smell at all.

Effect of Acids and Alkalis

(2) *Reaction of the agent* In a chemical works the substances which may enter an eye are usually either acid or alkaline in reaction. When discussing treatment no differentiation is needed between these two groups, as from a first-aid point of view any chemical injury demands the same immediate treatment and the same diagnostic procedure. It is, however, of advantage to know the difference in effect of acids and alkalis and it is wise to obtain a careful history so that an ophthalmologist can be informed of the offending agent during the later stages of treatment.

Acids cause precipitation of the protein of the cornea. This tends to give rise to opacity. In high concentrations, especially with substances such as sulphuric acid, there is grave liability of penetration of the cornea as a result of a splash entering the eye. With adequate treatment, however, there is usually early recovery of translucency of the cornea and regeneration of damaged tissue takes place.

Alkalis, on the other hand, tend to saponify the fatty layer of the cornea. There is a marked tendency to continuation of its action and opacity is more likely to develop in the later stages due to the formation of scar tissue. There is also more likelihood of the formation of adhesions between the eyelids and eyeball.

As opposed to alkalis, therefore, acids show: (a) Slower penetration and sharper demarcation of the lesion. (b) Little tendency for the corneal epithelium to slough off. (c) Little tendency to develop scar tissue. (d) Tendency of opacities to heal. (e) A clinical course which is predictable within a few hours.

Other Chemicals

In addition to acids and alkalis there is another group of chemicals worthy of mention. These substances, when they enter the eye, attach themselves to protein and alter its physical properties. This may lead to severe inflammation and degeneration of the surface of the eyeball and of the lens. Included in this group are mustard gas, the arsenicals, the lachrymators and the cyanides.

(3) *Physical properties* Another factor which determines the action of a chemical is its physico-chemical properties, chief amongst which is its solubility. In order to pass through the surface of the eye the chemical must be fat- or water-soluble or there must be a preliminary break in the surface. The penetration of water-soluble chemicals will not be nearly as great as those which are fat-soluble for the latter will be able to pass through the deeper layers of the cornea and cause considerable damage. It is for this reason that the action of an alkali is so much worse and so much more prolonged than the effect of an acid. Acids are water-soluble and alkalis are both water- and fat-soluble. Solvents are both fat-soluble and are protein precipitators. They, therefore, rarely involve more than the superficial layer as they rapidly become fixed near the surface.

To sum up, chemical injuries of the eye may be produced by internal or external action. External action is dependent on the concentration and duration of exposure, the reaction of the agent and its physical properties. With the exception of the highly concentrated acids, which are likely to penetrate the cornea, the most destructive effects must be anticipated in injuries arising from contact with concentrated alkalis.

In spite of all preventive measures, chemical injuries to the eye frequently occur. By far the most important single item in the treatment of chemical splashes of the eye is immediate and efficient first-aid treatment on the plant. Where an eye hazard is known to exist eye-wash bottles should be available at frequent intervals throughout the plant building. The gravity feed bottle is probably the safest and best for use in the plants and all workers should be familiar with the handling of such appliances. Any bottles or other pieces of apparatus which squirt fluid under pressure into an

injured eye are not to be recommended. It is, of course, essential that eye-wash bottles be maintained in a clean conditions and in good repair. It should be the responsibility of one individual to see that this programme is carried out and to make sure that they are always full.

Solutions recommended by various authorities are numerous, but it must be remembered that the essential in treatment at this stage should be fluid, fluid and more fluid. Ordinary water is quite sufficient, but there is some advantage in having some sort of mildly antiseptic solution in the bottles. Normal saline is probably the safest and it is advisable to add to it a small percentage of boric acid, simply to stop the growth of fungus in solution which may not be used at very frequent intervals. There are many buffer solutions which have been advised from time to time, but there is no real advantage in using these in the early stages after the injury has occurred. The emphasis should be on diluting and washing away the harmful substance rather than neutralising it.

Irrigation

Irrigation should be carried out with the patient lying down, as only in this position can proper control be exercised. First-aiders should only be satisfied that the job is being done properly when they can actually watch the irrigating fluid passing over the eyeball. It is not good enough to pour the fluid somewhere near the eye. Some authorities recommend that a patient sustaining a chemical splash in the eye should immerse the face in water and open the eyes under water. There is, however, always a spasm of lids when a chemical has entered the eye and great difficulty may be experienced in opening the lids to allow complete washing of the eyeball.

Irrigation must be carried out for at least *10* minutes on the plant (i.e., two bottles should be used). This time of 10 minutes should be insisted on. There is always a tendency to rush people to the ambulance room in an emergency of this type. It is this early irrigation which is so important and it should be impressed on first-aiders that they, and they alone, have the responsibility for saving an eye immediately after injury. After insuring that this has been done, the first-aider should cover the eye with a clean pad and bandage and transfer the patient as quickly as possible to the works medical department. Here, the eye should be thoroughly examined and this examination should be followed by further irrigation. Again, this is best done with the patient lying down, and it is a great help if a local anaesthetic can be used at this stage.

The choice of anæsthetic is a matter of opinion. Some ophthalmologists condemn the use of cocaine which, it is stated, softens the epithelium and tends to cause further damage. Others, however, continue to use cocaine and have never observed any ill effects. One or two drops of a local anæsthetic should be instilled into the eye on admission to the ambulance room.

In severe injuries no time should be wasted. Irrigation should continue for at least 45 minutes, again using normal saline or one of the numerous buffer solutions. If the eye is not so severely injured, a drop of two per cent fluorescein should be added before further irrigation. After irrigation any stain taken up by the damaged epithelium will be clearly visible.

When the all important irrigation has finished a further careful inspection must now be made of the lids, conjunctiva and cornea. Has the irrigation successfully removed all the chemical agent? Are there any solid adherent particles remaining? What is the extent of damage resulting? On the answers to these questions a decision must be made regarding the use of various eye drops, reference of the patient to an ophthalmologist, hospitalisation, or frequency of follow-up treatment.

Every factory medical department should contain the following medicaments: eye drops, such as sulphacetamide 10 to 30 per cent, atropine 1 per cent or homatropine drops, fluorescein and a bland oil such as parolein. The factory nurse or the industrial medical officer without specialised training should not go beyond the use of these preparations and the decision to use penicillin or other preparations should rest entirely in the hands of the ophthalmologist. It is a safe rule to limit the use of atropine to those cases where there has been damage to the cornea, but to instill sulphacetamide drops into the eye in every case—oily drops should be limited to cases where there is considerable lid damage, for it must be remembered that an ophthalmologist will have difficulty in examining a patient whose eye is full of an oily preparation. It is another safe rule to refer to an ophthalmologist every patient with corneal damage.

Minor Injuries

In minor injuries and in those not requiring specialised treatment it is often possible and highly desirable to keep the patient at work. Most will require follow-up treatment and it is an advantage to be able to perform this under proper supervision in the factory, rather than trying to instruct the patient or his relations to do it at home. When atropine or local anæsthetics have been used, the eye should always be covered, as in one case the vision is affected and in the other lack of sensation in the eye may result in the entry of other foreign bodies unknown to the patient. Shades should never be completely occlusive as normal evaporation cannot take place and conjunctivitis, if not present already, will occur.

It is obviously unwise to send a patient, who is for the time being a one-eyed person, back to a job where an eye hazard is known to exist. In addition, a person with one eye covered has little perception of depth and distance. There are, however, always jobs in a chemical factory where such men can be employed safely. Continuation of employment is not only of importance in providing an opportunity for adequate follow-up treatment; it also maintains the patient's confidence in his ability to return to his own job more quickly and therefore hastens his functional recovery.

Provision of alternative work is also important in the resettlement of severe chemical eye injuries after they leave hospital. Treatment does not cease when the patient receives his signing-off note and returns to the factory.

Success in treatment can only be claimed when the injured person is able to return to his pre-accident job, without any visual disability and with the knowledge that his eye protection is sufficient to prevent a similar mishap in the future.

People in the NEWS

● MR. E. OWEN has been appointed an additional director of the British Thermostat Co.

● MR. A. S. BISHOP has been elected president of the Institute of the Rubber Industry in succession to LORD BAILLIEU. Mr. Bishop is managing director of the Goodyear Tyre and Rubber Co.

● MR. E. D. WHITELOCK and MR. R. W. L. RAMSDEU have retired from the board of Brotherton and Co. Ltd., chemical manufacturers, Leeds. MR. C. L. EVANS has joined the board as director in charge of production.

● MR. T. C. FAWCETT, chairman of the chemical and allied trades section, Manchester Chamber of Commerce, was re-elected at the annual meeting held on 10 January. He is the northern regional manager of ICI Ltd. and chairman of Thomas L. Fawcett Ltd. of Leeds.

● MR. J. ROY GORDON has been elected executive vice-president of The International Nickel Co. of Canada Ltd. Mr. Gordon has also been elected executive vice president of The International Nickel Company Inc., the company's US subsidiary. He has been a vice-president of The International Nickel Co. of Canada since June 1953, and of The International Nickel Company, Inc., since January 1955.

● MR. LYMAN A. BLISS has been appointed president of Union Carbide Nuclear Co., a division of Union Carbide and Carbon Corp. Mr. Bliss succeeds MR. KENNETH RUSH, a vice-president of Union Carbide and Carbon Corp., who will continue to have overall responsibility for the corporation's nuclear and international activities. Mr. Bliss joined Union Carbide in 1922 as a cadet engineer for Linde Air Products Co., another division of the corporation. He advanced through the Linde organisation becoming a vice-president in 1940. In 1955 he was made vice-president of Union Carbide Nuclear Co. He has also held a number of executive positions throughout the corporation, including that of member of Union Carbide's research committee from 1944 to 1952.

● SIR ARTHUR ELTON, Bt., has joined the Shell Petroleum Co. and will serve under Mr. Brian Trench, head of public relations. He will be in charge of films. Sir Arthur became film adviser to Shell and producer-in-chief to the Shell Film Unit in 1936 under Mr. Alexander Wolcough. In January 1941, he was seconded to the Ministry of Information in charge of film production. Following appointments as film adviser to the Danish Government in the autumn of 1945, and to the Foreign Office in January 1947, he resumed his position as adviser to Shell in 1948 and was similarly employed by the Iraq Petroleum Company. Sir Arthur has just completed his second term as president of the Scientific Film Association, of which he was the founder.

W. E. Hamer, general research manager, Monsanto, who has been appointed a member of the new Standing Committee on Synthetic Detergents

● Awards under the Royal Society and Nuffield Foundation Commonwealth Bursaries Scheme are announced as follows: DR. S. BASU, reader in chemistry, University of Calcutta, to study the application of quantum mechanics to the solution of problems of chemical reactivity, at Oxford from February to July 1957; DR. D. W. J. CRUICKSHANK, lecturer in mathematical chemistry, Leeds University, to study theoretical aspects of the application of spectroscopic methods to the determination of molecular structures, at the National Research Council of Canada, Ottawa, for about three months from March 1957; DR. V. R. RAO, reader in physics, Andhra University, India, to study spectroscopic techniques in cytology at King's College, London, for three months from April 1957.

● MR. F. K. JOHNSON has been appointed to the Chemicals Division of Armour and Co. Ltd., Lindsey Street, London, EC1, to handle the sale of cationic chemicals to the petroleum industry in the United Kingdom. Previously, he was with the production department of the Associated Ethyl Co. Ltd.

F. K. Johnson

● MR. RUSSELL B. STOLLARD, who has been in this country representing the Chemical Division of the Food Machinery and Chemical Corporation since the beginning of this month, returned to the US yesterday, Friday.

● MR. H. W. CREMER, CBE, chairman of newly appointed synthetic detergents technical standing committee, Ministry of Housing, is a past-president of the Institute of Chemical Engineering (1947-48) and a past-president of the Royal Institute of Chemistry (1951-53). Senior partner in Cremer and Brearley, consulting chemical engineers, he became director of chemical warfare in 1918 and for the next two years was on the staff of DSIR. In 1920, Mr. Cremer began a long association with King's College, London, first as a chemistry lecturer and later, in 1928, when he introduced the study of chemical engineering, becoming director of chemical engineering studies. From 1939 to 1946 he was chief chemical engineer to Sir Alexander Gibb and Partners.

Obituary

The death occurred on 11 January at the age of 58 of Mr. Herbert Marston, a senior executive of R. Cruickshank Ltd., Birmingham, chemical manufacturers and electro-plating engineers. Mr. Marston, who was well known throughout the industry for his work on barrel burnishing methods, had been with the company since 1949, previously serving with the Radiation Group and the BTH Co., of Rugby.

Will

LIEUT.-COL. SIR ALEXANDER LEITH, former chairman of Bede Metal & Chemical Co. Ltd., who died on 9 November 1956, aged 87, left £35,408 2s 11d gross, £32,152 9s 10d net value. (Duty paid £6,809.)

Dangerous Goods

The 19th list of amendments to Appendix A of the 1951 *Report of the Departmental Committee on the Carriage of Dangerous Goods and Explosives in Ships* may now be obtained from HM Stationery Office, price 2s 6d.

Leading gas engineers from several Continental countries visiting the Luton works of George Kent Ltd. on Wednesday 16 January. The visit was arranged as part of the International Committee for the Study of New Gas-Distribution Techniques

APPLICATIONS OF LACTONES

Industrial and Therapeutic

By E. G. Curphey

LACTONES, originally of interest in the classical studies of the carbohydrates, particularly those involving the conversion of ketoses to aldoses, have within recent years found useful applications in industry and medicine. The lactones are, of course, useful ancillaries in organic synthesis as, for instance, they may be the means of introducing carboxy alkyl groups into a molecule. Utilising lactones, many substituted fatty acids may be prepared. Many of these acids have useful biological properties. Thus the indole butyric acids, for example, prevent tuber development in potatoes. Lactones may feature in cyclisation techniques and ring A of dl-cortisone acetate is obtained using propiolactone and di-l,4-dimethyl-2-keto-Δ1(11),6,9 octahydrophenanthrene. These groups of steroids have been studied clinically for arthritis and rheumatic complaints. Finally lactones have featured in the synthesis of 3-alkoxy analogues of vitamin B_6, the lactone protecting the hydroxy methyl group during methylation with diazomethane.

Pesticides and Fungicides

Modifiers in polymerisation processes have been obtained by reacting propiolactone with appropriate dithiocarbamates. The resulting β– thiocarbamyl alkane carboxylic acids can cyclise on dehydration to give the corresponding 1,3-thiazines (2-mercapto-4-keto5,6-dihydro-1,3-thiazine) which apart from functioning as accelerators are useful as pesticides and fungicides. In the manufacture of plasticisers suitable for synthetic rubber and polyvinyl chlorides, excess quantities of lactones have been treated with the salts of organic acids. Such a reaction features the role of ethylene oxides as reactive carbon centres. In its mode of action, therefore, propiolactone may be regarded as a keto-butylene oxide. Its reaction with disodium phthalate yields ester-type polymers of the structure—$(CH_2.CH_2.CO.O)_n$. While the free acid may be employed as a wetting agent, esterification with fatty alcohols, such as lauryl alcohol, affords plasticisers for p.v.c.

Lactonic structures have appeared in the synthesis of terephthalic acid, important in the manufacture of Terylene. Terephthalic acid has thus been obtained from the lactone of cyclohexane-2,5-diol-1,4-dicarboxylic ester, where the *polyanhydrides* first produced on heating of the lactone, are hydrolysed and then submitted to catayltic dehydrogenation. It is not known as yet whether this synthesis has any industrial significance. A facile industrial synthesis of terephthalic acid would be welcomed, since p-xylene from which terephthalic acid is prepared, is separated with some difficulty from the other isomers, all isomers occurring in specific fractions of petroleum distillates.

Polymerisation of the α-methylene γ-lactones give glass-like products. The colourless characteristics of the lactones of certain dyes are utilised in the manufacture of crayon materials for recording purposes. When such lactones are mixed with materials capable of effecting scission at the lactone linkage, a colour is regenenerated by virtue of the release of the parent dye. In 3,3-bis-(p-dialkylaminophenyl) phthalide, the change from methyl to ethyl is associated with a differentiation in colour from green to blue.

Azlactones may be regarded as the lactones of the enol tautomer of the N-aldehydo-amino acetic acids. Such derivatives have featured in the synthesis of penicillin, although unfortunately such a synthesis does not give high yields. Based on such a technique the antibiotic has been obtained from 2-benzyl-4-methoxy methylene oxazolone and $\beta\beta$-dimethyl cysteine.

Cold Drawn Fibres

Complex *bis*-azlactones have recently aroused interest in their roles in the production of novel polyamides. The fibres are essentially cold drawn in steam at 10x, where orientated and highly crystalline fibres are obtained. Being readily prepared at room temperatures, they are accordingly attractive in their application to industrial processes. Nylons, it will be remembered, are usually melt spun, and the polymerisation melt is important, too high temperatures tending to effect disproportionating reactions. Polymers *sub judice*, however, are solvent spun. The highly polar nature of the resin apparently renders the cold drawing in steam the only method at present reported for this experimental fibre. These fibres have been prepared by the addition of bifunctional amines to appropriate solutions of 2,2' *bis*-azlactones.

Polymers of high molecular weight are obtained by performing the polymerisation in aprotic solvents such as benzene and chloroform, solvents such as formic acid and *m*-cresol giving low molecular weight products. These polyamides are structurally new, being intermediate between the diamine-dicarboxylic acid polycondensates (nylons) and the polypeptide fibres resulting from the homopolymerisation of N-carboxyglycine or alkyl analogues. The azlactones have featured in the synthesis of penicillamine.

Lactones have been used in the preparation of the growth factor, pantothenic acid or its esters. Such growth promoting substances have been synthesised from β-alanine and α-hydroxy-$\beta\beta$-dimethyl-γ-butyrolactone. Many unsaturated lactones are biologically active. The δ-hexenelactones, for example, inhibit the growth of connective tissue. This has been demonstrated by the lesions produced in the wall tissue of the flat worm *Dugesia tigrina* (platyhelminthes) which was observed after treatment with M/20,000 solution of the lactones. The 4-methoxy mercapto-3, 4-dihydrocoumarines have been studied with respect to Bilharziasis, and to venous infections due to parasitic trematodes, common in Egypt and China. Finally, many unsaturated

(*Continued on page 164*)

Chemist's Bookshelf

Measurement of Physical Properties

INSTRUMENT TECHNOLOGY. VOL. II, ANALYSIS. *By* E. B. JONES. Butterworths Scientific Publications, London. Pp. xi+208. *40s.*

In Volume I of this treatise the author described instruments for measuring pressure, flow and temperature. This companion volume deals with methods used for measuring variables based upon chemical composition.

The treatment of the subject is based upon four main chapters. These deal respectively with sampling systems for gases and liquids, the measurement of density or specific gravity, the measurement of humidity, the measurement of chemical composition, and the measurement of viscosity.

By far the largest section of this book is that on chemical composition comprising approximately 135 pages. It deals with gas analysis by chemical absorption, , spectrochemical analysis, mass spectrometers, electrochemical measurements, gas analysis by thermal conductivity and heat of reaction measurements, and paramagnetic oxygen meters. Some of the material presented will be regarded by some readers as appertaining solely to research methods. However, as the author points out, all the instruments are capable of being adapted for process control.

It is easy to criticise a well written book which attempts to present a large field in a small space. The author has wisely selected his material to represent a wide range of instruments, but perhaps a short section on the measurement of radioactivity would have enhanced its value. E.J.C.

Heitler Monograph Revised

ELEMENTARY WAVE MECHANICS WITH APPLICATIONS TO QUANTUM CHEMISTRY. 2nd edn. *By* W. HEITLER. Oxford University Press, London. Pp. 193. *18s.*

Professor Heitler has considerably revised his original monograph, first published in 1945, by extending the chapters on the chemical bond and adding sections on diatomic molecules and time-dependent theory. The work, designed primarily for chemists having a limited knowledge of mathematics, constitutes a remarkable feat of condensed but lucid writing. The reader is led gently from a discussion of the experimental basis of quantum mechanics to a theoretical description of the periodic system of elements by way of the wave equation and the hydrogen atom, and pertubation theory and two electron systems.

Inclusion of a chapter on the Zeeman effect is particularly welcome since it helps greatly in understanding spin and magnetic quantum numbers (but is nevertheless frequently omitted in texts of this kind).

The remainder of the book, which is devoted to the theoretical description of chemical bonding, is less satisfactory. Though the high standard of writing is maintained, no mention is made of the molecular orbital method, which is in many ways conceptually simpler than the valence bond method to which the writer adheres. It is unfortunate also that space could not be found for an explicit statement of the Hellmann-Feynman theorem, a theorem which is valuable in elucidating the role of *exchange* forces in bonding.

However, the book can be commended to chemists wishing to acquire some understanding of the theoretical description of their subject; in spite of its increase in volume, it can still be described as 'pocket-size.'

A. DALGARNO.

Comprehensive Treatise on Wax

COMMERCIAL WAXES. A SYMPOSIUM AND COMPILATION. 2nd edn. edited by H. Bennett. Chemical Publishing Co. Inc., New York. 1956. Pp. 688. *$15.00.*

Completely revised, considerably enlarged and brought up to date, this new edition of a well-known technical work is divided into seven main sections, which cover natural waxes (from mineral, vegetable, animal and insect sources); manufactured and synthetic waxes (fatty alcohols, esters of polyhydric alcohols, poly-glycols, hydrogenated oils, chloronaphthalenes, ketones, amines, amides, nitriles, synthetic and polymeric waxes); physical properties of waxes; wax technology (adulteration, determination of density, melting, wax solutions etc.) and waxes in industry (technical uses of waxes).

In the sixth section there is a glossary of terms used in wax technology with special tables and a list of substitutes. The final section (nearly 200 pages) is a wax formulary; there is also a comprehensive index.

The book is a mine of information on the various aspects of waxes. It is very readable and contains a large number of tables and graphs. It is recommended to all concerned with waxes.

Perhaps the most impressive section is the formulary. Here, arranged in alphabetical order, are formulae for several hundred industrial products ranging from an adhesive to join metal or glass to wood, to waterproofing preparations. In many cases several formulae are given (there are 30 recipes for floor polish).

Print, paper and style are pleasing, and errors remarkably few. If any criticism were to be made, it would be perhaps that a slightly reduced price would be more appropriate. A.R.P.

Interferometry for Students

AN INTRODUCTION TO INTERFEROMETRY. *By* S. TOLANSKY. *1956.* Longmans, Green & Co., London. Pp. 223. *21s.*

Interference effects in optics have been known from an early date and studies of these phenomena have been intimately linked with the development of the theories of the propagation of light. A small number of books have been published on interferometry, but they have

all tended to concentrate on the particular interest of the author, and have not provided an elementary introduction for degree students. The present text is based upon the lecture course which Professor Tolansky gives to the second year students who are reading for Part I of the B.Sc. Special Degree in Physics at London University, but it is likely to cover any typical degree course in physics. Since interferometry is only a small part of optics, and the latter, itself, is likewise only a small section of the physics course the need for a suitable introductory textbook for the student is obvious.

Interferometry is an elegant branch of optics in which simple tools (e.g. mirrors and restricted sources of light) can be used to measure the size of a molecule or the diameter of a star. The Raleigh interferometry, one of the several interferometers described by the author, can for instance be used to measure precisely the refractive indices of gases or liquids.

References to the literature have been left out of this book since it is considered that the student will not have sufficient time to refer to the numerous original papers, many in a foreign language, which have been published on this subject. However, a list of some specialised books on interferometry is included at the end of the volume, for any enthusiast who wishes to pursue the subject further.

The book is well produced and should be of much value to physics students and others interested in the application of interferometry to their own specific problems. G.S.E.

The Year in Review

ANNUAL REVIEW OF PHYSICAL CHEMISTRY. VOLUME 7. *Edited by* H. Eyring. Annual Reviews, Inc., Palo Alto, California. *1956*. Pp. vii+503. *60s.*

This volume follows a similar pattern to that established for earlier volumes in the series. Thus, 17 of the 20 chapters deal with topics which are treated annually and there are also three chapters on special topics which do not justify summary at such frequent intervals. The subjects selected for this occasional treatment in the present volume are: 'Ion Exchange,' 'Combustion and Flames' and 'High Temperature Chemistry.'

The choice of authors continues to be excellent, and almost all are well known for their own contributions to the fields which they are reviewing. This means that the accounts are comprehensive and authoritative; in no case is there merely an ill-digested catalogue of new discoveries. In fields where the current interest is high, the reviewers have an extremely difficult task in producing a coherent account and yet making adequate mention of upwards of 200 new publications.

Faced with this difficulty, some of the reviewers have tended to concentrate on particular aspects of their field. For example, in the chapter on 'Quantum Mechanics,' Moffitt and Ballhausen have concentrated on crystal field theory with particular reference to transition-metal complexes, while Tobolsky has dealt with initiation of polymerisation in the chapter on 'Polymers.' This tendency is probably one that should be encouraged because the branches of the subject which are not treated can always be covered in future volumes.

Complete author and subject indexes are a valuable feature of the book and, although there are a few misprints, the general standard of production continues on the high level that has come to be expected from this annual series. It is undoubtedly a volume which should appear on the shelves of every chemical library.

CHARLES KEMBALL

Cost Too High?

AN ENCYLOPEDIA OF THE CHEMICAL PROCESS INDUSTRIES. *By* JEFFREY R. STEWART. Chemical Publishing Co. Inc., New York. *1956*. Pp. 820. *$12.00.*

This book is based on the fourth edition of *Stewart's Scientific Dictionary* which was issued in 1953. The title of the latter work was changed because it did not adequately cover the subject matter.

The encyclopedia is essentially an extensive collection, arranged in alphabetical order, of definitions of various scientific and technical terms encountered in the chemical process industries, and includes such subjects as raw materials, processes, equipment and finished products. Where trade names and the names of manufacturers of equipment or chemical products are quoted these are usually American in origin, and the work is therefore of greater value to US than UK readers.

Because of this and its relatively high price its appeal to British chemists may be limited, although there is much useful information in its pages. G.S.E.

Lactones

(*Continued from p.* 162)

lactones show blastocholine activity in that they prevent the germination of seeds.

More complex steroid lactones function as cardiac poisons, and have been used in congestive heart failure. Their physiological action is one involving the lengthening of the systolic phase of the cardiac cycle, so permitting the heart to rest during the filling of the ventricle. In such steroid structures, the lactone moiety is attached to the C17 atom. Beta-chlorolactones are used in the synthesis of these valuable clinical substances. The reaction is a Reformatsky type of reaction utilising metallic zinc and lactone. By such an expedient, *trans*-dehydroandrosterone acetate is converted to $\Delta^{5:6:10:22}$-3-acetoxy-21-oxy-*nor* choladienic acid.

The incidence of 'Sweet clover disease,' originally observed in cattle, was established as due to a haemorrhagic factor, a lactone—3,3-methylene *bis*-(4-hydroxycoumarine). Its obvious pharmacological value was realised and the lactone found clinical uses as an anticoagulant in thrombosis. In 1942 patents were applied for, claiming a method of preparation for this substance.

One of the most recent lactones studied in contemporary chemotherapy is 8-hydroxy-3-p-chlorophenyl coumarine which has exhibited protection against influenza virus. It is now being studied as an anti-carcinogenic agent. Other complex natural lactones such as the podophyllotoxins are powerful mitotic poisons. Accordingly they have shown curative effects on malignant growths. Unfortunately their toxicity precludes their clinical application, but such lactones have been taken as models for the synthesis of analogues which while behaving as carcinostatic agents may not be cytotoxic.

Overseas News

OHIO-APEX IS NOW PART OF FMC ORGANIC CHEMICALS DIVISION

OHIO-APEX Division of the Food Machinery and Chemical Corporation begins the New Year as part of a new FMC group, with the recently formed FMC Organic Chemicals Division assuming responsibility for Ohio-Apex products as well as for a variety of speciality organics formerly associated with FMC's Westvaco, Becco and Fairfield Divisions.

Ohio-Apex commenced operations in 1929 at Nitro, W. Va. In 1935 it developed the first non-yellowing plasticiser for nitrocellulose lacquers, dibutoxyethyl phthalate (Kronisol(R) plasticiser). DOP (dioctyl phthalate), one of the major vinyl resin plasticisers, was commercially developed at Ohio-Apex in 1938 and made solely at Nitro till 1942. In 1956 a plant to produce Dapon(R) resin (a dry powder prepolymer of diallyl phthalate) was put on stream. Dapon(R) has important uses as a component of moulding powders for electrical parts, and

An electronic master distribution panel which illustrates the use of moulded parts from DAPON(R) resin and vinyl coated wire containing Ohio-Apex plasticisers

as a laminating resin for aircraft structural parts and decorative laminates. It has potential laminating and binder resin uses with paper, glass, cotton, synthetic fibres and other inert substances.

In addition to plasticisers, Ohio-Apex has developed processes for making various specality chemicals, including high-purity anhydrous aluminium chloride.

Mr. Henry S. Winnicki, president of the FMC Organic Chemicals Division, stressed that one of the primary aims of the new division is to produce and market organic chemicals and plastics developed through the activities of the central research laboratory of FMC's chemical divisions at Princeton, New Jersey. Mr. Bert S. Taylor is manager of the Ohio-Apex Division as well as vice-president of the FMC Organic Chemicals Division. Bernard H. Jacobson, FMC vice president and president of the Ohio-Apex Division, becomes chairman of the FMC organic chemicals policy committee.

Sasol Troubles Due to Foreign Influences

TEETHING troubles of the South African Coal, Oil and Gas Corp. (Sasol) were due almost entirely to inferior foreign materials and defective planning by foreign advisers. This was claimed recently by Mr. Eric Louw, SA Minister of External Affairs. Because of advice from SA experts, he said, the Union no longer needed foreign planning or advice.

The way was now open for the further expansion of the indigenous oil industry, which would make South Africa independent of imported oil.

A £2 million fertiliser plant is to be erected at Sasolburg by Fisons (Pty.), the associated company of Fisons Ltd. It is expected to be in full production in 1959 and will produce 200,000 tons of superphosphate per year.

Progress in U.S. Borax and Chemical Expansion Scheme

Satisfactory progress in the United States Borax and Chemical Corporation's $20 million (about £7.15 million) programme for new and increased production capacity has been announced. Last July the company was formed by the merger of the United States Potash Co. with Pacific Coast Borax Co., a subsidiary of Borax (Holdings) of the UK.

Conversion to open-pit mining will permit almost complete recovery of the entire ore body.

The company also plans to treble its research efforts and as from the end of July, to spend $1 million (about £357,000) annually for this purpose.

Indian Tariff Changes

Under SRO2905 (Customs Notification 121) the following articles falling under Tariff Item 87 of the Indian Customs Tariff are exempt from so much of the duty as is in excess of 25 per cent *ad valorem:* Raw materials for the plastics industry—(a) Styrene; (b) cellulose plastics, excepting cellulose acetate; (c) vinyl resins.

Under SRO2906 (Customs Notification 122) the following raw and semi-manufactured materials used by the plastics industry is exempt from so much duty as is in excess of 25 per cent *ad valorem:* Raw celluloid, cellulose nitrate (sheets, rods and tubes), rennet casein and polyvinyl chloride resin. These notifications supersede Customs 3, dated 7 January 1950.

New Italian Plant for Synthetic Rubber

The synthetic-rubber factory which ENI (Ente Nazionale Idrocarbori) is building at Ravenna will be completed ahead of schedule, and the production will be started at the end of the current year. Output of the new factory, originally scheduled at 35,000 tons a year, will be increased to 60,000 tons.

Yugoslav/Polish Chemical

At the end of November last year, a Protocol covering trade in 1957 between Yugoslavia and Poland was signed which provides for an exchange of goods each way totalling US $31 million.

Yugoslav exports will include aluminium, zinc and pyrites concentrates, magnesite, caustic soda and other chemicals. Polish exports will include chemicals, coal, coke, rolled and drawn metals and machinery of various kinds.

ENI Launch Nuclear Project

A special company, entitled Agip Nucleare, is being floated in Italy as a member of the ENI Group. Its task will be that of constructing two thermo-nuclear centrals in Italy.

Big Increase in Israel Potash Production

Production at the Sodom potash works, Israel, is stated to have now reached a monthly rate of 6,000 tons. Total output last year reached 40,000 tons, of which 35,000 tons were exported to about 15 markets. Principal customers were Britain, Japan, Italy and Ceylon.

Lack of trained technical personnel is a factor in the low productivity of the plant. An annual output of 150,000 tons before 1958 is desired. Adequate water supplies are also giving rise to difficulties in washing evaporating pans. The high cost of transporting the potash from Sodom to the port of Haifa is stated to account for 25 per cent of total production costs.

Australian Submarine Minerals

Extensive submarine deposits of rich mineral sand containing rutile and zircon have been discovered by the survey ship of the Royal Australian Navy, HMAS 'Warrego,' off Nambucca Heads on the New South Wales coast. The deposits are reported to spread over the ocean floor up to 15 miles from the coast in depths ranging from three to 100 fathoms. Several beach mining com-

panies are said to be investigating the possibility of dredging the minerals.

With the developments in atomic energy and jet aviation, the production of rutile (a source of titanium) from mineral sands has become an important industry in Australia. This year Australia's exports of rutile are expected to earn about £A7 million to £A2 million more than last year, with production topping the 100,000-ton mark.

Mobile Gas Installations in French Cameroons

Commercial exploitation of the gas pockets discovered in the French Cameroons is now being considered and an engineer is to visit the US to study the technique. An installation being considered is said to be mounted on 'Skis' to facilitate movement from pocket to pocket. The installation is stated to permit the treatment of 150,000 cubic metres of gas daily, giving an annual production of 2,000 tons of butane, 1,000 tons of propane and 10,000 tons of petrol.

Portuguese Cylinder Plant Opened near Lisbon

CIDLA—Companhia de Combustireis Industriais e Domesticos, Lisbon, opened in November last new installations on the outskirts of Lisbon near the SACOR oil refinery of which it is a subsidiary. Butane and propane produced in the refinery are piped to the new installations for bottling in cylinders each containing 13 kilos of gas. Ten thousand such cylinders can be filled daily and it is reported that this capacity, adequate to meet present consumption of about 10,000 tons annually, could be substantially increased.

New Nickel Deposits

Discovery of a very large deposit of high grade nickel ore in the heart of Ungava is reported by the Premier of Quebec, Mr. Maurice Duplessis. The International Nickel Co. of Canada is interested and has informed the Premier that it is prepared to spend $5 million for further exploration of the site and to invest $100 million to bring the ore-body into production.

Canadian Firm to Make Carbon Tetrachloride

Initial production of carbon disulphide from expanded facilities at its plant in Cornwall, Ontario, is announced by J. D. Converse, vice-president of Cornwall Chemicals Ltd.

The company, owned jointly by Canadian Industries Ltd. and Stauffer Chemical Co., has been producing carbon disulphide for the last 15 years. The current expansion is the third to be made since 1946. Continued growth in production of viscose rayon and in transparent regenerated cellulose film accounts for most of the increase in demand for carbon disulphide. However, consumption as raw material for manufacture of other chemicals has been a significant factor in determining the size of the latest installation which has added about 60 per cent to the previous capacity.

Cornwall Chemicals will also soon use its own carbon disulphide in manufacture of carbon tetrachloride. A modern plant to make carbon tet. is now under construction and is part of the present expansion programme. The entire project will require an investment of over $1,000,000.

Tetraethyl Lead for Japan

According to reports, the Toyo Soda Industry Co., and the Dar-ichi Bussan are planning the joint establishment of a Y60 million company (Ethyl Chemical Industry Co.) to manufacture tetraethyl lead. The Japanese petroleum industry is said to import some Y1,000 million worth annually from the US.

A new petrochemicals company with Y1,200 million capital is the Furukawa Chemical Industry Co., which will be located at Kawasaki.

US Capital for Spanish Firm

The Spanish firm of Revalorizacion de Aceitas y Grasas has been authorised to accept participation of up to 50 per cent capital by Archer Daniels Midland Co., Ohio, US, towards increasing production of glycerines, fatty acids, industrial oils, fat alcohols, etc.

Uranium Can be Obtained from Superphosphates

Italian newspapers report that Professor Guntz of the University of Algiers has come to the conclusion that uranium could be obtained also from superphosphates, large quantities of which are available in North Africa.

According to Professor Guntz's calculations each ton of superphosphates would yield quite an appreciable quantity of uranium. It is interesting to note that in course of his studies, he has also ascertained the presence of vanadium in North-African phosphates.

Fertiliser Plant for Spain

Union Espanola de Explosivos said to be investing 1,283 million pesetas over the next five years on development projects. Installation accounts for 283 million; manufactures under study and in preparation, 235 million; raw materials, 250 million; miscellaneous, including a proposed fertiliser factory at Seville, 515 million.

Japanese Fertiliser Interests

It is understood that the Ministry of International Trade and Industry has invited several companies to consider participation in a project for the domestic production of potash fertiliser. (All Japan's requirements are at present imported.) According to the report a new method of production has been successfully tested, by which citric soluble potash fertiliser could be obtained with about 28 per cent potassium content by processing locally available quartz trachyte (dolerite). It is said that the Ministry's plan entails the establishment of a company with Y300 million capital to be put up by the Japan Development Bank and interested companies. Production of some 50,000 tons a year would begin in fiscal 1958/9.

US Firm to Expand Output of Irradiated Polythene

In the US the General Electric Co. is planning a major expansion in production of irradiated polythene from 300,000 lb. per year to some 1.6 million lb. per year.

Irradiated polythene is being used to insulate telephone and other cables, motors, generators and other apparatus.

South African Uranium

Yearly uranium production in South Africa is reported to be as big as that of any country in the world including the total annual output of Russia and Eastern European countries. South Africa's annual production of uranium oxide is of the order of 4,500 tons.

Yugoslav Chemicals

In order to protect the home market the Yugoslav Government has decided to stop exports of certain goods. Certain products of the chemical industry come under this decision. Thus there will be no export of artificial fertilisers, sulphuric acid, copper sulphate, or caustic soda. A permit from the Committee for Foreign Trade will be required for the exceptional export of any one of these products.

Change of Address

New Metals & Chemicals Corporation, Tokyo, has moved to more spacious offices at Kankoji-Kaikan Building, 3 Ginza Nishi, 8-chome Chuo-ku, Tokyo. Its PO Box, Central 565 and cable address, Nemechem, Tokyo, remain unchanged. The company is the correspondent in Japan of New Metals & Chemicals Ltd., London.

Canadian Tariff Hearing on Chemicals

The Canadian tariff board has published terms of reference on chemicals in connection with its projected enquiry. The reference broadly covers: basic industrial chemicals, coal tar products, dyes, pigments and paints, industrial alcohols, fertilisers, insecticides, fungicides, disinfectants, explosives and chemicals for use in producing soaps, detergents and rubber. Excluded are petroleum products, abrasives and pharmaceutical products. Plastics are included only where adjustments are necessary following changes in other rates.

If the Board decides that tariff changes are desirable, they will prepare a revised schedule of tariff items with recommendations as to rates of duty. No general change in margins of preference is contemplated.

Written submissions on groups of products should not be made to the board until dates of sittings have been announced. UK interests wishing to be notified of dates and places of sittings should contact the Secretary of the Tariff Board, 70-74 Elgin Street, Ottawa.

FIGURES FOR SA COMPANIES' URANIUM PRODUCTION

Cost of Doornfontein's Plant Repaid by 1966

IN HIS STATEMENT on uranium production by the Doornfontein Gold Mining Company Ltd., of the New Consolidated Gold Fields Ltd., the chairman, Mr. E. S. Hallett, presented statistics concerning uranium production since 1 July 1955 together with additional information which it had not been possible to incorporate in the December quarterly report. The company was accepted as a uranium producer in September 1953.

A joint uranium plant with a rated capacity of 80,000 tons leached per month was erected at the property of the company and trial runs were started in September last. In November last the plant operated at its full capacity.

The yield of uranium oxide per ton of slime treated was found to be greater than the uranium oxide content of the one reserve which at 30 June 1956 amounted to 0.18 lb. per ton over a stopping width of 40.0 inches. The reason for this is that uranium oxide content of the run-of-mine ore is insufficient to warrant its extraction by direct treatment, so that it is necessary to isolate, by means of screening, that portion of the ore which can be treated economically for the extraction of uranium oxide.

Carbon Leader Reef

In this particular mine the uranium oxide is closely associated with the carbon seam of the Carbon Leader Reef. Because of the friable nature of the carbon seam, a considerable amount of the gold and uranium oxide is contained in the very fine portions of the ore.

Ore is delivered to the mill in three different size grades. The coarsest is subject to hand picking to recover any gold and uranium-bearing rock. The other two products are treated for the recovery of gold. The slime from the smaller product is then pumped to the joint plant for extraction of uranium.

Uranium is extracted from the slime in three stages. First, the uranium is leached from the slime by sulphuric acid and the uranium-bearing solution is separated from the slime by filtration. This solution is then concentrated in ion exchange columns and in the third stage the uranium is recovered from the concentrated solution in the form of a chemical precipitate by the addition of ammonia. This precipitate is then sent to a central calcining plant for the final preparation of uranium oxide.

During the quarter ended 31 December 1956, a total of 70,200 tons of slime from this mine was treated. The total yield of uranium oxide amounted to 15,803 lb., the yield per ton leached being 0.225 lb. The content of uranium oxide of the ore reserve was 0.18 lb. per ton.

By 30 September 1966, the date of termination of the company's contract with the Atomic Energy Board, the capital cost of the joint uranium plant and of ancillary equipment will have been repaid in full. The company, by agreement with the West Driefontein Co., will continue to have facilities for the treatment of slime at the joint plant. Therefore, this company should be in a favourable position to continue production of uranium oxide after the existing contract ends provided that suitable terms for sale of the product are available.

According to the chairman of the Linpaards Vlei Estate and Gold Mining Co. Ltd., Mr. W. M. Barclay, this company was accepted as a producer of uranium in September 1952 and a plant for extraction of uranium from ore mined from the Bird Reef Series was erected. This plant has a rated capacity of 50,000 tons leached per month and commenced production in January 1955. Full production began from 1 July 1955.

From the quarter ended 30 September 1955 to the quarter ended 31 December 1956, 719,000 tons of ore were treated in the leaching plant. The total uranium oxide recovered was 884,641 lb.. The yield of uranium oxide per ton leached averaged 1.2308 lb.

The Bird Reef Section ore reserve fully developed at 30 June 1956 was estimated at 644,000 tons averaging 2.27 lb. uranium oxide per ton over a stoping width of 36.2 inches.

Uranium Oxide

Details of the production of uranium oxide and pyrites by the Vogelstruisbuilt Gold Mining Areas Ltd. are given in the statement by the chairman of the company, Mr. J. M. M. Ewing. On 8 October 1952 arrangements were made with the Atomic Energy Board of South Africa for erection of a uranium extraction plant. Uranium oxide and pyrites occur in both the Main Reef and the Kimberley Reef and in slime residue dams at the mine. The principal source of uranium oxide is the Kimberley Reef which can be recovered economically by direct leaching of the ore with sulphuric acid.

Ore from the Main Reef or slime must first be treated by flotation to obtain a relatively high uranium oxide content. Ore at present being mined from the Main Reef contains approximately 0.18 lb. uranium oxide per ton. Sampling of the slime dams has given estimates of approximately 0.18 lb. of uranium oxide per ton. The current Kimberley Reef residue contains approximately 0.45 lb. per ton of uranium oxide and the concentrate about 0.94 lb. per ton.

At Vogelstruisbuilt the leach plant is able to treat 42,000 tons per month of a mixed uranium-bearing feed. This contains approximately 0.57 lb. per ton uranium oxide.

At full capacity, the primary flotation plant is supplied with 150,000 tons per month of residue made up of 80,000 tons of old slime dams containing 0.18 lb. of uranium oxide per ton and 70,000 tons current Main Reef residue from the gold extraction plant which also contains 0.18 lb. of uranium oxide per ton. In the primary flotation plant a high proportion of sulphur in the feed is recovered in the form of pyrites. Some 10,000 tons of concentrate containing both pyrites and uranium oxide is obtained.

Leach residue amounting to 42,000 tons per month passes to a secondary flotation plant where a pyritic concentrate is recovered. In this plant a recovery of about 3,600 tons of pyritic concentrate per month is expected.

Average Yield Per Ton

Total tons of ore treated in leaching plant from the quarter ended 30 September 1955 to 31 December 1956 was 706,000. The total uranium oxide recovered was 362,679 lb. The yield of uranium oxide average 0.5018 lb. per ton.

The statement of the chairman, Mr. E. S. Hallett, of the West Driefontein Gold Mining Co. Ltd., records that this company was accepted as a uranium producer in April 1951. In conjunction with the Doornfontein Gold Mining Co. Ltd., a joint uranium plant was erected. Trial runs began last September and in November the plant operated at full capacity.

Tonnage of slime supplied by this company in November and December 1956 was greater than of the Doornfontein. During the quarter ended 31 December 1956, a total of 85,000 tons of slime from this mine was treated in the leaching plant. The total yield of uranium oxide amounted to 22,124 lb., the yield per ton leached being 0.258 lb.

Better Results

In the Central Mining-Rand Mines group uranium disclosures concern Blyvooruitzicht on the Far West Rand and Harmony Gold. The Blyvoor mine, which lies in between Doornfontein and West Driefontein properties has obtained better results than either of its neighbours.

Blyvoor's uranium development during the past quarter averaged 3.88 lb. uranium oxide per ton. Production of the metal at this mine, during the past 18 months has fluctuated around the 130,000 lb. per quarter mark. During the past three months it amounted to 135,795 lb., equal to an average yield of 0.29 lb. uranium oxide per ton.

Harmony Gold's uranium production last quarter amounted to 111,350 lb. for an average recovery of 0.442 lb. per ton.

US MANUFACTURERS SEE NEW USES FOR ACETYLENE AS CHEMICAL RAW MATERIAL

ACCORDING to an article in *Chemical and Engineering News* (1957, **35**, No. 1) acetylene is regarded as a chemical raw material of the future by US manufacturers.

Calcium carbide-based acetylene has, for a number of years, been the raw material for trichloroethylene, perchloroethylene and for vinyl chloride, vinyl acetate, and acrylonitrile. Even Du Pont's neoprene stems from carbide-based acetylene. Price will be the most important factor in future developments involving acetylene. The opinion in the US, however, is that there will shortly be 50-million-pound-a-year plants in operation, bringing prices down to 8, 7, possibly even 6 cents a pound.

At the present time 'hydrocarbon' acetylene in the US appears to be used for vinyl chloride (Carbide and Carbon and Monsanto) and acrylonitrile (American Cyanamid and Monsanto). Dow Chemical intends to make acetylene and methylacetylene at Freeport, Texas. Rohm and Haas is also replacing its present source, calcium carbide, by a 'hydrocarbon' acetylene plant, for acrylonitrile production. Diamond Alkali has also said it would build an acetylene plant, to provide the raw material for vinyl chloride. American Cyanamid is to add to its Fortion plant capacity at Avondale for acrylonitrile production.

Although produced in large tonnage quantities acrylonitrile and vinyl chloride are not considered as more than 'scratching the surface of acetylene's potential as a starting material.' The General Aniline and Film Co., at present produces in commercial quantities from carbide-generated acetylene, 1,4-butanediol, butynediol, butyrolactone, propargyl alcohol, propargyl bromide and polyvinyl pyrrollidone.

Hydrocarbon acetylene plants are at present located in the natural gas region of the south-west. Until now, too, acetylene has been made starting from 'scratch, but it is considered likely that it may shortly be produced as a co-product in ethylene operations.

Carbide and Carbon, which is cracking refinery gas to produce ethylene for its Californian polythene plant, is disposing of the acetylene which also results, for welding purposes. Phillips Chemical Co. is to produce ethylene and by-product acetylene at Sweeny, Texas. The ethylene is required for polythene production and it is understood that the acetylene will be sold.

In Germany, reports the *Chemical and Engineering News* (1957, **35**, No. 1), Hoechst is understood to have developed a process which gives a mixed ethylene-acetylene stream. A new acetylene process, still in the very early stages of development is also reported at Knapsack, Germany. Société Belge de l'Azote at Liege, Belgium, is also stated to have developed a process which separates acetylene from other chemicals in the process stream. This process has been licensed to Blaw-Knox, US.

Housing Ministry sets up Committee on Industrial Effluents

A NEW TRADE effluents sub-committee of the Ministry of Housing's central advisory water committee has been appointed. Its chairman will be Sir Frederick Armer, until recently deputy secretary of the Ministry of Health.

The new sub-committee will examine existing legislation and the operation of common law respecting the disposal from trade premises of liquid effluents (including solids in suspension), but not radioactive effluents; it will also examine the problems, including financial problems, concerned with those legal aspects and will consider whether farm or any other premises should be designated as trade premises for the purpose of effluent disposal.

Members of the sub-committee will examine the position regarding the section of the Rivers (Prevention of Pollution) Act, 1951, which requires the Minister's consent before a River Board can take proceedings under the Act. It will also advise whether it is desirable to suggest extending the operation of that provision beyond the term of seven years from the passing of the Act and, if so, for what further period.

The full committee comprises Sir Frederick Armer, chairman; Mr. J. H. Edmondson, general manager, Sewage Disposal Committee, City of Sheffield; Mr. H. E. Hopthrow, assistant secretary, ICI Ltd.; Dr. S. H. Jenkins, chief chemist, Birmingham, Tame and Rea District Drainage Board; Mr. G. S. Mason, chairman, pollution prevention committee, River Boards Association; Mr. W. A. Muddell, chairman, Trent River Board, chairman, land drainage committee, River Boards Association, and vice-chairman, RBA executive council; Alderman C. W. F. Ridley, chairman, East Middlesex Drainage Committee, vice-chairman, Lee Conservancy Catchment Board; Mr. G. R. Taylor, director, Textile Finishing Trades' Association; Mr. A. Titherley, director, Mid-Kent Water Company; Mr. E. T. Wadman, vice-chairman, National Farmers' Union Parliamentary Committee and chairman, East Sussex Water Board.

Antibiotic Used as Fish Preservative

ACCORDING to a spokesman for the British Trawlers' Federation, Government and commercial tests have shown that an aureomycin powder, Acronize (marketed by Cyanamid Products Ltd.), mixed in ice, can prolong the freshness of fish for at least 60 hours. The British Trawlers' Federation have therefore formally asked the Government for permission to use this antibiotic preparation to delay spoilage and to ensure that the public obtains fish in the best possible condition.

Canada, following extensive tests carried out in Vancouver by Dr. Hugh Tarr, a leading fisheries scientist, permitted the use of Acronize on fish last autumn. Acronize is already in use in the US on poultry. Other countries also using this antibiotic include Brazil, Chile, Colombia, Costa Rica, Greece, Iran, Mexico, the Philippines and Spain.

Coventry's Gas From Tar

Up to 15 per cent of Coventry's gas supply will be produced from gasified tar it was announced on 21 January by the West Midlands Gas Consultative Council. Gas is now being produced from tar at a lower cost than from oil. Experiments so far carried out have saved thousands of gallons of oil.

Stores for Gases

Three new permanent stores for compressed oxygen and dissolved acetylene have been established by British Oxygen Gases. They are at: Highland Haulage, Longman Garage, Inverness; D. M. Wallace and Sons, Bowmount Engine Works, Kelso; and Londonderry and Lough Swilly and Letterkenny Railways, Londonderry.

NICKEL — 1956

(*Continued from facing page*)

The output of Ni-Hard abrasion-resisting nickel-chromium cast irons also showed an increase over 1955.

The use of nickel in electronics showed an increase in 1956. Nickel is used principally in tubes and in permanent magnets for speakers. In television and radio receivers and high fidelity sound systems. Guided missiles make extensive use of vacuum tubes containing nickel elements because of the ability of such tubes to operate at temperatures higher than transistors. High quality nickel alloy resistors are also required in their control and computing systems. The forthcoming International Geophysical Year programme will employ nickel in a wide variety of ways, in the control equipment of rockets and satellites, in telemetering devices, and in airborne mass spectrometers and other detecting devices.

Consumption of nickel as a catalyst during 1956 by the chemical and allied industries is stated to have shown an increase, with consumption about three times that of five years ago.

WEST'S NICKEL OUTPUT WAS RECORD IN 1956

Review of the Year by Inc Chairman

ACCORDING to Dr. John F. Thompson, chairman of the board of The International Nickel Co. of Canada (Inco) Ltd., the year 1956 was one of the most eventful in the history of the nickel industry. The world's second largest nickel production operation which will result in a substantial increase in nickel supplies by 1960 was begun by International Nickel in Manitoba US.

Production of nickel by the free world at approximately 450,000,000 lb., set a new high record in 1956. This compared with the previous high output of about 427,000,000 lb. in 1955 and 387,000,000 lb. in 1954. Output by Canadian producers again accounted for about 80 per cent of the free world's supply. Deliveries of the metal in 1956 by International Nickel, world's largest nickel producer, were approximately 285,000,000 lb. In addition, the company made available nearly 6,000,000 lb. of metallic nickel by converting concentrates supplied by another producer.

Deliveries

Figures of deliveries of other producers estimated from company or Government reports or other published statements for 1956 are as follows: Falconbridge Nickel Mines Ltd., 43,000,000 lb. Sherritt Gordon Mines Ltd., 19,000,000 lb. Other free world deliveries included 31,000,000 lb. from the US Government's plant at Nicaro, Cuba; 14,000,000 lb. from Hanna Nickel Smelting Co. in Oregon, US; 22,000,000 lb. produced by the French company, SA Le Nickel, from New Caledonian ores; and 26,000,000 lb. from all other sources, a major portion of which was refined in Japan from New Caledonian ores.

Distribution of the total free world nickel supply in 1956 was approximately the same as the previous year, with about 65 per cent going to the US and 35 per cent to Canada, the UK and other countries of the free world. Heavy defence production continued to use a substantial part of the nickel distributed to the US, far in excess of the percentage for other principal base metals.

There was a sustained heavy demand for nickel alloys in every field of application in Europe and North America in 1956. Increased amounts of the metal were employed for defence uses, and, although the quantity available for civilian applications was somewhat greater than in 1955, limitations in supply and continuation of deliveries of Government stockpile continued to retard the full development of established and potential markets. In the UK, there was a slackening in the general demand for nickel consumer goods, especially in such industries as automotive, radio and television. However, the use of nickel in the production of stainless steels and engineering alloy steels increased some 10 per cent above that of 1955 and many new industrial projects were initiated, especially in the petroleum and petrochemical industries.

In the US 74,300,000 lb. of nickel originally scheduled for shipment to the Government stockpile was diverted to industry by US Director of Defence Mobilisation. Industry also received a portion of a further 5,000,000 lb. authorised as extra diversion for the fourth quarter.

In order to deal with higher costs and facilitate maximum production, The International Nickel Co. of Canada Ltd., increased its price of refined nickel by 9½ cents (US) per lb. effective 6 December 1956. Like increases were also made by the company's US subsidiary, The International Nickel Co. Inc., and its UK subsidiary, The Mond Nickel Co. Ltd. This brought the export price of electrolytic refined nickel, from the company's Port Colborne, Ontario, refinery, to 74 cents (US) per lb., from the level of 64½ cents per lb. which had prevailed since 24 November 1954. The price includes the 1¼ cents US imports duty which is paid by the company. Similar changes in price were also made for other forms of primary nickel and nickel oxide sinter. New price schedules were also announced for nickel and nickel alloys in the form of mill and foundry products produced at the plants of the company's US and UK subsidiaries.

Stockpile Nickel

Nickel of Canadian origin diverted from the Government stockpile was priced at 98 cents per lb. and for nickel of US origin approximately $1.17 per lb. This nickel, which was sold at higher than market quotations, was high production-cost nickel contracted for at premium prices by the United States Government and which would not have been available either to the Government stockpile or to industry had it not been for the Government premium price arrangements.

Relatively small amounts of nickel originating mainly from Japan were sold in the US market at about $2.00 to $2.50 per lb.

The largest proportion of the primary nickel available to industry was again used by the steel industries of the free world, principally in the production of stainless steels, engineering alloy steels, and jet engine alloys. During the year the output of the nickel-containing stainless steels reached an all-time high. This record production was materially aided by the substantial use of stainless steel scrap. Producers in the UK, France and other countries followed the US in initiating production of the lower nickel-containing types of stainless steels for use in transportation equipment and certain domestic and allied applications. The chromium-nickel grades continued to be employed in increasing quantities in practically all industries, ranging from consumer products to atomic energy and high speed aircraft.

Availability of nickel limited the output of the nickel-containing engineering alloy steels in 1956 and production approximated that of 1955. Established applications, such as in automobiles, trucks, tractors, aircraft, military equipment, farm machinery, road building equipment, and components for the atomic energy, electronics, railroad and petroleum industries were responsible for the major portion of the consumption of the engineering alloy steels. Most important new applications were those involving heat-treated alloy steel plates and shapes and increasing attention was given to new 'super' strength steels developed initially for aircraft landing gears.

High nickel - chromium alloys developed by International Nickel, such as the Nimonics in the UK, and the Inconels, developed by Inco's US subsidiary, have been widely used in the construction of aircraft turbo-prop and jet engines, and industrial gas turbines. Monel nickel-copper alloys have continued to be employed throughout industry because of their resistance to corrosion and good mechanical properties. Inconel nickel-chromium alloys were used where high strength and resistance to corrosion or heat are required, and Incoloy iron - nickel - chromium alloys where resistance to oxidation at moderately elevated temperatures is required.

Corrosion Resistance

Because of their resistance to corrosion, nickel and nickel containing alloys have been employed in every phase of nuclear development. Demand continued to exceed the supply in the nickel-plating industry although the supply during 1956 was somewhat greater than in 1955. Among the new developments in this field during the year was the application of 'levelling type' bright nickel deposits to critical items of textile mill equipment requiring hard, smooth corrosion-resisting surfaces. Electro-deposited nickel has continued to be a market of pre-eminent importance in Europe, despite the increasing challenge offered by aluminium and stainless steel. Copper-nickel-zinc alloys known as nickel silvers continued as the most popular base materials for silver-plated tableware, and there has been a continued demand for cupro-nickel alloys for heat exchanger tubes used in the marine, petroleum and power industries. Nickel-containing high-tensile aluminium bronze is being increasingly used in increasing quantities in Europe as well as in the US for propellers, for large passenger and cargo ships as well as pleasure boats.

Production of Ni-Resist corrosion-resisting nickel cast irons increased during the year and have been used particularly in the chemical process and petroleum industries and in high-powered engine service to resist corrosion, heat and wear.

(Continued on facing page)

GROWING US MARKET FOR COAL TAR CHEMICALS

A REPORT on the market for industrial and coal chemicals prepared by the Commercial Department of the British Embassy in Washington indicates that despite the vast expansion in recent years of the American chemical producing industry to meet the continually growing demands of the chemical consuming industry, statistics of US imports for the past six years show an upward trend although there are fluctuations from year to year.

Imports of industrial chemicals from the UK have averaged $6 million annually and statistics for the first half of 1956 show that imports were running at an appreciably higher rate than in previous years. The value of US imports of British coal tar chemicals has decreased annually since 1951, due mainly to the cessation of imports of benzene which the domestic industry now produces in increasing volume from petroleum sources. Nevertheless, the value of imports of coal tar chemicals from the UK is still running at the rate of some $7½ million annually, representing an increase in imports of certain coal derivatives which offsets the decrease in imports of others now being produced in greater volume by the domestic industry.

Thus, it appears that US demands for consumption still exceed US production with respect to many items of industrial and coal tar chemicals, and that opportunities still exist to increase UK exports of certain chemical products in competition with domestic or other foreign suppliers.

Higher Imports from UK

Materials of which imports from the UK have increased most sharply are tricholoroethylene, sodium cyanide and cyanide salts, ethers and esters and flavouring extracts, Ammonium chloride is the only industrial chemical of which imports from the UK have decreased markedly in this period. As regards coal tar chemicals, imports of benzene from the UK have fallen from a value of over $16 million in 1951 to nil in 1955, in which year there were for the first time substantial imports of benzene from the USSR and Poland. Imports from the UK of creosote oil and cresols have also declined. On the other hand, imports of naphthalene, coal tar acids and medicinals have increased. Imports of coal tar chemicals from Germany and Switzerland, particularly of acetanilide, dyes and medicinals, have risen steadily during the past six years.

The explanation offered for the contraction of the traditional American market for British exports of coal derivatives such as benzene, creosote oil and cresols is that the former dependency of the US on foreign sources of such crude materials has been reduced by the rapid expansion of the US petroleum chemicals industry. Synthesis of benzene from petroleum sources has increased every year in the period under review and is currently at the rate of some 115 million gallons annually compared with 185 million gallons from coke-oven production.

With encouragement from the Government, largely in the form of rapid tax amortisation, the US chemical industry has achieved during this period a huge expansion programme to provide for the deficiencies in production of many kinds of chemicals that became apparent during the Korean War period. The demand for imports, therefore, does not reflect the continually increasing consumption of all kinds of raw chemicals. However, the US continues to export industrial and coal tar chemicals to the extent of twice the value of imports of these products.

Eighth Minibition to be Held at Folkestone

THE EIGHTH in the annual series of Minibitions organised by the Purchasing Officers' Association will take place at the Hotel Metropole, Folkestone, from 26 to 28 September 1957.

Purpose of the Minibition is to provide an opportunity of exhibiting products of interest to buyers in industrial and public undertakings. The stands, all of uniform size, test the exhibitors' ability to design an economical yet effective display within the confines of a small 'shop window.'

The charge for the hire of each stand is £25, including descriptive matter in the official catalogue.

Further information may be obtained from the Secretary, Purchasing Officers' Association, Wardrobe Court, 146a Queen Victoria Street, London EC4.

AEI Nuclear Group and Morgan Crucible Link for Graphite Machining

A NEW JOINT company to specialise in the machining of graphite blocks for the construction of the graphite moderator piles in atomic reactors has been formed by Associated Electrical Industries—John Thompson Nuclear Energy Co. Ltd. and the Morgan Crucible Co. Ltd.

The new company is titled Nuclear Graphite Ltd., and Morgan Crucible's contribution to the enterprise will be its experience in handling graphite, having been engaged in the fabrication of this and kindred materials since its formation in 1856.

One of the leading companies in the development of carbon and graphite materials for industry, it has already gained experience in the atomic field, having just completed the manufacture and machining of the special graphite blocks to be employed as the neutron shield for the Dounreay fast breeder atomic reactor.

Nuclear Graphite will aim at meeting the increasing demand for large machined graphite blocks of intricate shape to close dimensional limits. Additional plant is being laid down to meet the needs of the greatly expanded atomic power generation programme. It will provide machining capacity to cover likely expansion in the British nuclear power programme and for overseas orders. A site is now being prepared.

Morgan Crucible is engaged in the development and production of many special materials and components for use in the atomic field. Its subsidiary Morganite Resistors Ltd., Jarrow, is providing components for electronic and control equipment, while another subsidiary, Morgan Refractories Ltd., Neston, Cheshire, is making and developing a range of special refractory materials.

Shell Grant to College

Shell Research Ltd., is to give the Manchester College of Science and Technology £20,000 for the provision of living accommodation for the students. Dr. W. Hubball, has been elected a member of the Court of Governors.

Pfizer European Sales Executives Meet

Pfizer executives from 10 European countries attended a conference at the British company's Folkestone headquarters in the second week of January. Third from right is R. C. Fenton, chairman and managing director, Pfizer Ltd., third from left is J. A. Rodgers, director and general manager; extreme right is W. Brown, sales executive. Other executives hail from Norway, Belgium, Holland and Denmark

Metallurgical Progress and the Chemical Engineer

OF considerable importance to the chemical engineer is the work of metallurgists, and a periodical survey of what they are doing may prevent a good deal of delay in applying their discoveries and developments. This specially contributed article gives details of new alloys and steels etc.

PURE ALUMINIUM and some aluminium alloys are subject to blistering corrosion in distilled water above 200°C. This attack has been explained as mechanical damage resulting from the diffusion of corrosion-product hydrogen into the metal. Work has been carried out with a view to developing methods of preventing this type of corrosion. The most outstanding success has so far been obtained by the addition of alloy elements to aluminium, and particularly nickel.

An alloy containing 1 per cent nickel is recommended for use wherever its normal reaction rate with water or a solution is tolerable. Welded specimens of the alloy have also been found to give satisfactory corrosion resistance. Significant velocity or flow of the water past the metal gave rise to somewhat higher corrosion rates. Further work on the effect of added elements is proceeding.

The union of tubes to tube sheets in making tubular heat exchangers has always presented difficult problems. In making exchangers for radioactive chemical process service, however, such problems are particularly serious, for absolute integrity must be preserved and no upkeep repair is feasible. Methods of joining stainless steel tubes to tube sheets for this type of equipment have been developed. Two specific conditions are allowed for, namely, where the corrosive medium passes through the inside of the tubes, with the steam on the outside, and where the steam passes through the tubes and the corrosive medium is on the outside. The new process is economical and requires, it is said, a minimum of skill on the part of the welder. (2)

New Type of Stainless Steel

There is a new type of stainless steel containing carbon 0.8, manganese 0.6, silicon 0.4, chromium 17.0, nickel 4.2, and molybdenum 2.75 per cent. It is soft and ductile, readily machinable, and can be hardened at a temperature low enough to prevent excessive scaling and distortion. The yield strength of the material is in excess of 62 tons per sq. in. when it is double-aged, but the ductility and impact strength are superior when sub-zero cooling methods are employed. (3)

Metallurgists have given the chemical engineer a wide range of stainless steels to choose from to suit particular applications. Molybdenum-containing austenitic stainless steels have the best overall resistance to chemical corrosion. For heat-resistance, austenitic stainless steels containing 25 per cent chromium, 20 per cent nickel are superior. Straight chromium steels will withstand such conditions as hot flow gases containing sulphurous fumes, etc., while as indicated above, there are stainless steels for use where ductility is the predominant need. (4)

The chemical industry needs many stainless steel tubes, not only in straight lengths as pipe-lines, but also highly complicated as inter-connected coils for condensers and heat exchangers. Weldable types of stainless steel and advances in welding practice have greatly widened the scope in this field. Tubes of stainless steel now obtainable are capable of withstanding internal pressures up to 200,000 lb. per sq. in. with small bores in relation to their external diameters and indicate the steady improvement in tube-making techniques. (5)

A steel has been developed for constructional material, primarily for use in the form of plate, and possessing in the quenched and tempered condition a minimum yield strength of 40 tons per sq. in., as well as adequate toughness at low temperatures and good weldability. In addition the steel has enough ductility to undergo bending to reasonable radii, is machinable and can be gas-cut without special precautions. The composition is carbon 0.1 to 0.2, silicon 0.15 to 0.35, manganese 0.6 to 1.0, nickel 0.7 to 1.0, chromium 0.4 to 0.8, molybdenum 0.4 to 0.6, vanadium 0.03 to 0.1, copper 0.15 to 0.5, and boron 0.002 to 0.006 per cent. The material is designed for pressure vessels. (6)

Surface Flaws

It is often of the utmost importance to be able to detect surface flaws in non-porous metals. The dye penetrant method recently introduced is quick and simple to use and works equally well with both magnetic and non-magnetic metals. The surface to be examined is first cleaned, the dye is applied and allowed to penetrate, surplus dye is then washed off, and a developer added which intensifies the dye and shows up the flaws by contrast. Two of the methods used are employed in daylight, and the third uses a fluorescent dye which is inspected under ultra-violet light. (7)

Rust-resisting properties of low alloy steels in air are of small advantage if low carbon steel can be kept in such excellent condition that rusting never begins. They are particularly applicable, however, where structures are exposed to highly corrosive conditions, and where it is impracticable to guarantee efficient paint maintenance. Durability of steel plates under these conditions is being appreciably prolonged by making them of a steel containing about 0.3 per cent copper instead of mild steel. Similar conditions apply to wires and other thin steel sections which are incapable of being readily painted. The increased use of low alloy structural steels is, in fact providing one of the best methods of reducing the effects of corrosion in structural steel. (8)

Ductile nickel chromium alloy cast irons are among the new ferrous materials introduced of recent date. These irons have a good resistance to corrosion by acids, alkalis and salts. Their toughness is comparable, at ordinary temperatures, to that of steel and is well retained at lower temperatures. They resist heat and oxidation, wear and erosion. Their fluidity allows the production of complicated designs, and their machining qualities are equivalent to those of ordinary pressure-type grey cast iron. By suitable choice within the group, thermal coefficients of expansion can be controlled over a wide range and within close limits, while the non-magnetic property of some of these irons is an additional advantage. The special properties of these irons are obtained by the introduction of a small magnesium content when the metal is being melted. (9)

Particular attention should be directed to one of the newest of the ultra-high-tensile steels, containing carbon 0.43 per cent, silicon 1.6 per cent, manganese 0.8 per cent, nickel 1.83 per cent, chromium 0.85 per cent, molybdenum 0.38 per cent, and vanadium 0.08 per cent. Strengths approaching 134 tons per sq. in. are obtainable without significant loss of ductility, showing the outstanding properties of the material. (10)

Brush Plating

Brush plating of metals is carried out by merely rubbing a cotton-wool brush over the part to be plated. Recent developments have made it more practical and economical. The work is made the cathode, and a cotton swab saturated with a new electrolytic solution is made anodic and run backwards and forwards over the area to be plated.

Although the new process gives deposits resembling those of ordinary bath plating, an important advantage is that the abrasion of the anode pad against the plating surface results in a high degree of adhesion without any special preparation or pre-etching of the surface. Since etching decreases resistance to fatigue, this is of great value. The abrasion also produces pore-free deposits, except in the case of black nickel plate. Even chromium plate has no fine cracks. (11)

Wear-resistant surfaces are being applied by flame-plating to steel, cast iron, aluminium, copper, titanium and even manganese, so extending the surface life of parts made from these materials. The plating is tungsten carbide, which gives a corrosion-resistance similar to that of cobalt. It is not affected by mild alkalis, detergents, lubricating oil or atmosphere free from acid fumes, but is attacked by most acids and strong alkalis. It cannot be deposited on chromium-plated objects nor on carbide alloys. At present it is being used for

gauges, spindles, mandrels, bearings and many other items subjected to constant and heay wear. (12)

A new high nickel alloy has been developed to withstand corrosion of unusual severity. It has the specific ability to resist certain hot acids and oxidising chemicals, as well as high resistance to other conditions. It contains about 40 per cent nickel, together with about 21 per cent chromium, 3 per cent molybdenum, 1.75 per cent copper, 31 per cent iron and small amounts of manganese, silicon and carbon. The comparatively high nickel content together with molybdenum and copper make the alloy much more resistant to hot sulphuric, sulphurous and phosphoric acid solutions than any of the ordinary stainless steels, it is claimed. The chromium content is adequate in combination with the nickel to ensure resistance to a wide variety of oxidising chemicals. It is tough, strong, weldable alloy with excellent mechanical properties, and is produced in all the standard forms, such as plate, rod, seamless condenser tubing, pipe and extruded tubing. (13)

Nickel-plated pressure vessels, hard-nickel-plated both inside and out in one of the largest and most unusual operations of its kind ever undertaken, are being produced in thousands for work in atomic energy plants. (14) A requirement which has become commoner of late is long life in springs having to operate at exceptionally high stresses. A new material has been developed for this work, being a precipitation-hardening nickel-base alloy with iron, chromium and cobalt in its composition. Its modulus of elasticity is about the same as that of music wire, and its ultimate strength is usually about 166 tons per sq. in. Much, however, depends on the method of manufacture in determining its success for spring applications. (15)

Valve Seats and Discs

Maintenance-free service from valve seats and discs is now possible, it is said, with a newly-developed nickel-chromium-silicon alloy, which outlasts the valves in which it is used for most severe kinds of valve service. It eliminates the renewing, regrinding or replacing of seats and discs throughout the life of the valve. Typical chemical composition is 70 per cent nickel, 16 per cent chromium, and 10 per cent silicon. The valve parts are shell or precision moulded, with as-cast hardness usually up to 600 Brinell. The tensile strength is over 54 tons per sq. in. It (the alloy) provides exceptional resistance to seizure, galling and wear as well as corrosion. It also resists attack from steam and many industrial chemicals. (16)

A material which can be handled like clay for modelling, yet two hours later hardens into a rigid, tough, steel-like mass, is making something of a sensation. It is a combination of 80 per cent steel and 20 per cent plastic, and is easy to use. A special hardening agent is added to the plastic-steel mixture, which is then stirred with a screwdriver, and pressed or poured into the desired shape. No heat or pressure is required. Once hard, the material can be sawn, threaded or ground with ordinary metal-working equipment. Four types are available. One is a putty which can be applied to a vertical surface and will not run or sag; the second is a viscous liquid which can be poured; the third is a heat-resistant material for making moulds for the plastics and rubber industries; and the last, in which aluminium replaces steel, is an aluminium putty for filling blow-holes and flaws in aluminium castings. The mixture has excellent resistance to many acids, alkalis and solvents, and high abrasion resistance. The compression strength is about 8 tons per sq. in. and the tensile strength over 6 tons. The impact strength is also high. It can be stored indefinitely, and contains neither inflammable solvents nor materials liable to evaporate and spoil. (17)

Spheres for processing phosphorus trichloride to make tricresyl phosphate are being made for the first time by a new method. In this solid nickel plates are integrally and continuously bonded to heavy steel backing by a special high vacuum process, using a non-ferrous alloy intermediate layer. The method is said to combine a continuous high strength bond with a guaranteed uniformity of thickness in the clad layer. The spheres are 8 ft. in diameter and are now installed in the plant of a large chemical manufacturer. (18)

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FOR YOUR DIARY

MONDAY 28 JANUARY

CS—Belfast: Queen's University, 7.15 p.m. 'Paint Research—Electron Microscopy and related Techniques' by T. R. Bullett.

TUESDAY 29 JANUARY

CS—Dundee: Chemistry Department, Queen's College, 5 p.m. 'The Life and Work of Perkin' by Professor J. Read.

WEDNESDAY 30 JANUARY

RIC—London: South-West Essex Technical College, Forest Road E17, 7 p.m. 'Some Aspects of Inorganic Peroxy Compounds' by R. Lait.

SCI (London Section)—London: 14 Belgrave Square SW1, 6.30 p.m. 'Some Aspects of Packaging' by F. A. Paine.

THURSDAY 31 JANUARY

Fertiliser Society—London: Lecture Hall of the Geological Society, Burlington House, Piccadilly W1, 2.30 p.m. 'The Use of Different Types of Phosphate Rock in Single and Triple Superphosphate Production" by T. P. Dee, R. J. Nunn and K. Sharples.

FRIDAY 1 FEBRUARY

RIC—Brighton: Brighton Technical College, 7 p.m. 'Acetylene and Allene Chemistry' by Professor E. R. H. Jones.

SATURDAY 2 FEBRUARY

I.Chem.E. (Midlands Branch)—Birmingham: The Midlands Institute, Paradise Street, 2.30 p.m. Annual general meeting. 3 p.m. 'Automatic Control of Continuous Distillation Plant' by E. J. Eaton and R. Parkins.

Plant Extensions

Extensions are to be erected to the premises of T. Hill-Jones Ltd., chemical, charcoal and bitumen manufacturers, at Meesons Wharf, High Street, Stratford, London E15.

Market Reports

OVERALL DEMAND REMAINS HIGH

LONDON The overall demand for industrial chemicals remains at a good level both on home account and for shipment, with contract specifications covering good quantities. There is a continued satisfactory demand for caustic and chlorate of soda and for bicarbonate of soda, and most other items in this section are moving steadily into consumption. Interest in the potash chemicals has been moderately good and a steady flow of new enquiry has been reported for hydrogen peroxide, barium chloride, formaldehyde and for both grades of borax and boric acid. Firm price conditions are ruling in most sections of the market. Pitch is an active item on a steady coal-tar products market.

MANCHESTER Current reports on Manchester market for heavy chemicals point to a reasonably good demand from the textile and allied trades for a wide range of products against contracts, and, with a few exceptions, deliveries to other industrial users are on steady lines. Home trade enquiries during the week have been on a fair scale. Shipping business seems to have been about maintained at its recent level. Quotations generally continue on a firm basis. There is a fair movement of supplies of fertilisers and the demand for some lines is showing a gradual expansion. Among the tar products pitch, creosote oil, and the benzols are finding real outlets.

GLASGOW A fair volume of business, both in spot and contract deliveries, can be reported from the Scottish heavy chemical market, and a varied range of chemicals have been in demand. Apart from the increases in transport charges, prices have remained fairly firm.

CATIONIC ROAD EMULSIONS REVOLUTIONISE CONSTRUCTION

Production in UK Brings Prices Down

RECENT developments in road emulsions are described in Memo No. 6 issued by Armour and Co. Ltd., Chemical Division, Lindsey Street, London EC1, which deals with the introduction of cationic emulsifiers as an alternative to the traditional soaps. This is said to represent an almost revolutionary step forward because cationic road emulsions function under all weather conditions and with practically every type of road stone.

Some of the attempts during the past year to formulate cationic emulsions, however, have been resisted by the industry because of high costs. The situation has now changed with the production in this country of powerful cationic emulsifiers, such as Arquad S-50 per cent, which permit the manufacture of cationic emulsions at the same cost as the traditional emulsions.

Some four years ago, Armour and Co. introduced into road construction another chemical, Duomeen T, a heavy duty anti-stripping agent for surface dressing, macadam, cold asphalt, etc. (the CHEMICAL AGE, 24 November 1956, p. 318). Price of this product has not increased since its introduction.

Use in France

Largely due to climate, the proportion of bituminous binder applied in the UK in emulsion form is comparatively small. Road emulsions are, however, widely used abroad and in France 43 per cent of all bitumen used for road making during 1954 was in emulsion form. The proportion of cationic emulsions remains small.

Basically road emulsions are fine dispersions of globules of oil in water. Addition of emulsifying agents ensures permanent dispersion. In the conventional anionic emulsion it is usual to use crude soaps, such as iron oleate or alkali resinates as emulsifiers.

Of the two basic methods of preparing emulsions, the mechanical and the chemical, the mechanical method depends on submitting the phases of the emulsion to high sheering stresses in a colloid mill, and in the chemical method the molten bitumen is poured into an alkaline solution contained in a mixer equipped with blades which can be rotated at speeds up to 1,000 r.p.m. In this process the 'soaps' are formed *in situ* by saponification by the alkali of the naphthenic acids contained in the bitumen.

The best results are often obtained by a combination of both methods.

When applied to the road, the emulsion is required to 'break.' This consists of the binder separating from the water and ideally leaving a continuous film adhering to the road. The factors effecting this rupture are: evaporation of water; capillary absorption of the water by the road and aggregate surfaces; chemical coagulation; mechanical agitation or impact.

In the first two cases 'break' is obtained by the emulsion becoming unstable due to a decrease in water and the resultant preponderance of binder. Chemical coagulation results from reaction of the emulsifying agents with chemical constituents of the road and aggregate surfaces. Thus the emulsifier is removed from the interface where it is stabilising the emulsion and the emulsion 'breaks.' Mechanical impact is probably one of the lesser causes leading to 'break' and occurs mainly by the emulsion passing through the spray nozzle and then impinging on the road followed by rolling.

For Wetter Climates

Owing to different working conditions and also due to more favourable climatic conditions in the southern part, the Continent is using more emulsions than the UK. With the introduction of the cationic emulsion this technique can be safely extended to the wetter parts of the world. The use of road emulsions is not suggested as an alternative to hot surface dressing, but rather as an additional method.

The traditional anionic emulsions have a number of inherent disadvantages that have restricted their use. In their manufacture, for example, it is advisable to use soft water, for hard water will react with the emulsifying soaps and lead to premature 'break.' Cationic emulsions are stable to hard water, which is used in their production and thus the cost of water softening is often saved. Anionic emulsions cannot be successfully applied unless the aggregate and road surfaces are warm and dry for they principally rely on water evaporation and absorption for their 'break.' If the stones are wet they will not absorb water and this will impede the occurrence of 'break.' Wet, cold weather delays the evaporation of the emulsion water. Any water already present on the road will, of course, further increase the water content and delay or even prevent the break occurring, resulting in road failure.

Furthermore, even if the emulsion breaks successfully and the continuous film of binder is applied to the road and aggregate, this binder is still susceptible to the hazards of wet weather stripping. With cationic emulsions the break is mainly achieved by chemical coagulation. The cationic surface active agent is orientated at the binder/water interface in such a way that the hydrophobic portion is dissolved in the binder with the positively charged polar groups facing the water. When brought into contact with stone surfaces the emulsion becomes attached to the stone which is completely coated with binder. In other words, the emulsion breaks instantly under all circumstances, irrespective of the presence of water.

Cationic emulsifier acts as a 'link' between the binder and the stone, resulting in a resistance to wet weather stripping. In fact, the surface active agent acts as both emulsifier and 'built-in' anti-stripping agent. A properly prepared cationic road emulsion can be successfully applied to all types of road stone even during wet weather. It has also been shown that cationic emulsions used for soil stabilisation give far superior results in terms of re-wet strength and water absorption than those obtained from soils stabilised with anionic emulsions.

A number of surface active agents can be used in the production of cationic bituminous emulsions. The actual chemical used and the production technique employed varies with the manufacturer, but in general it appears that the water-soluble Duomeen salts and the Arquads (produced by Armour and Co. Limited) have been successfully employed. Armour Memo No. 6 gives suggestions for making cationic emulsions.

Both Arquads and Duomeens are being produced in this country and are available in bulk. They are packed in 45 Imperial gallon drums containing, in the case of the Duomeens, approximately 360 lb. and the Arquads approximately 400 lb.

Applications for Armour surface active agents include anti-stripping agents for surface dressing, macadam, etc. (technical bulletin C-2/3), soil stabilisation with Arquad 2HT-75 per cent (market development memo 5) anti-static agents for plastics components, such as road furniture (technical bulletin L-11/3), and the use of wetting agents for paints (technical bulletin L-4 and L-8).

New Sedimentology Lab at Reading University

Shell Petroleum Co. has given £20,000 to assist in the establishment of a laboratory in sedimentology in the Department of Geology in the University of Reading. More than three quarters of industry's raw material and most of its fuel, such as coal and oil, come from sedimentary rocks and therefore fundamental research in this field is an urgent need for British industry.

Apart from the encouragement of postgraduate research, the creation of a national laboratory as a focus for the resources and work at present dispersed over several institutions is a major aim. At Reading, the study of sedimentology has for 20 years been part of the degree course in geology.

Dunlop Convenant

The University College of North Staffordshire, Keele, of which Sir George Barnes, D.C.L., is principal, is to receive £500 a year for seven years by a deed of covenant entered into by the Dunlop Rubber Co.

700-page Catalogue of Laboratory Apparatus

An impressive and comprehensive 700-page catalogue of chemical laboratory apparatus has been published by Griffin and George Ltd., Ealing Road, Alperton, Middlesex. It represents the first major publication of the company since 1 July 1954, when it was formed by the merging of Griffin and Tatlock Ltd., W. and J. George and Becker Ltd. and Standley Belcher and Mason Ltd.

Much newly designed appartus appears in catalogue 56S including balance lamp; electrochemical analysis apparatus; 6 in. analytical fractionating column; vapour phase chromatographic apparatus; bomb calorimeter; skeletal atomic models; deioniser; Nivoc Kemiframe; analytical balances.

Also included are items of 'classical' apparatus which still form the greater part of the chemist's equipment. It is pointed out that the design of much of the apparatus catalogued results from systematic study carried out in recent years by the British Standards Institution. Many of the specifications contained are based on prior recommendations by the technical committee of the British Laboratory Ware Association.

The present volume will be followed by catalogues of educational physics apparatus and specialised chemical apparatus.

Review of Benzole Technology

Third edition of 'The Review of Benzole Technology' summarises the information of interest to the benzole and associated industries that was published during 1955. Priced £1 1s, post and packing 9d extra, it is available from the National Benzole and Allied Products Association, Wellington House, Buckingham Gate, London SW1.

Endewrance Corrosion Resistant Alloys

Newly established division of Dewrance and Co. Ltd., Great Dover Street, London SE1, to handle Endewrance high alloys, said to be particularly suited for components where heat, abrasion, corrosion and erosion resistant qualities are necessary, has published two new brochures, Nos. 682 and 687. The division also handles the company's patent TLB metal powder deposition process and powdered metals for high temperature brazing. Dewrance is also working in collaboration with Coast Alloys Inc., New Jersey, for the development and sale of high alloy castings in this country, the Commonwealth and a number of European countries.

Brochure 682 describes the physical properties of Endewrance high alloy castings, while brochure 687 deals with hard facing welding rods.

Bleaching Inedible Fats with Chlorine Dioxide

Bleaching of inedible fats with chlorine dioxide is the subject in a new 12-page illustrated booklet issued by the Industrial Chemicals Division of Olin Mathieson Chemical Corporation, Baltimore, Md.

The booklet describes methods of purifying tallow and other, inedible fats and protecting them against deterioration, chlorine dioxide bleaching of tallow by the dry gas and wet methods, and a procedure and apparatus for determining the effectiveness of chlorine dioxide as a bleach.

Advantages of chlorine dioxide selectively include simplicity of use, low cost and high yield. Chlorine dioxide bleaching also enables renderers to employ the principle of mixed cooking, thereby increasing production of fancy tallow and upgrading grease.

Phosbrite Chemical Polishing Solutions

Two new data sheets on Phosbrite 150 and 159 have been issued by Albright and Wilson Ltd., 49 Park Lane, London W1. Each of these Phosbrite polishing solutions is said to be suitable for all grades of aluminium from commercial to super purity. They will polish all the alloys of aluminium, except the high silicon content die-casting alloys.

Electro-deposition of Metals

A 28-page reference book on the electro-chemical deposition of metals is available from Fescol Ltd., North Road, London N7. It includes a detailed technical section on the properties of nickel and chromium and lists, in tables, the resistance of both metals to corrosion.

Benzole Recovery Plant

All aspects of benzole recovery plant are featured in publication 63 recently produced by W. C. Holmes and Co. Ltd., Turnbridge, Huddersfield. Notes are included on oil stripping plant, a system of oil stripping, progress in design, wet stripping, vacuum distillation, fractionating columns, benzole rectification and sulphur compounds.

Nickel Developments—Canada Surveyed

Literature referred to in the current issue of *The Nickel Bulletin* (October/November 1956) includes a comprehensive survey of nickel developments in Canada, new American Welding Society specifications for welding rods and electrodes for joining nickel and nickel alloys. Details of the compositions specified are shown in a table and an abstract of the British Iron and Steel Research Association, 'Atlas of Isothermal-Transformation Diagrams of BS En Steels,' (2nd Edition).

In the section on heat- and corrosion-resisting materials, surveys of particular interest are: The effects of contamination by vanadium and sodium compounds on the air corrosion of stainless steel; Attack of scaling-resistant materials by vanadium pentoxide.

Also included in this section is a review of the papers presented at the symposium on atmospheric corrosion of non-ferrous metals held in June 1955.

Copies of the Nickel Bulletin are available free from publicity department, the Mond Nickel Co. Ltd., Thames House, Millbank, London SW1.

Automatic Combustion Control

Leaflet 110 by James Gordon and Co. Ltd., Dalston Gardens, Stanmore, deals with the company's latest designs of automatic combustion controllers. Equipment described includes both pressure and flow controllers and relays and servomotors.

Handbook of Dutch Chemicals and Manufacturers

A useful 386 page guide to the Dutch chemical and pharmaceutical industry has been published by Vereniging Van de Nederlandse Chemische Industrie, Javastraat 2, Gravenhage. Entitled 'Nederlandse Chemische en Pharmaceutische Producten en hun Fabrikanten,' it is priced at D.Fl.16.50. Chemicals are grouped according to the industries in which they are used. Names and addresses of manufacturers are listed.

Microscopy Catalogue

Accessories for microscopy and biological science are listed in a new catalogue (*List AC*) issued by George T. Gurr Ltd., 136-8 New Kings Road, London SW6. The catalogue, of 28 pages, is profusely illustrated. All prices quoted are net.

Billingham Dispute Ends

About 100 members of the Constructional Engineers' Union, employed by various contractors at the Billingham works of Imperial Chemical Industries Ltd., have returned to work after a strike over non-unionism. No employees of ICI were involved in the stoppage.

SCI Annual Meeting

Seventy-sixth annual meeting of the Society of Chemical Industry will be held in Leeds during the period 8 to 13 July. Members attending are asked to inform the secretary at 14 Belgrave Square, London SW1, by 31 January.

Commercial News

Bowmans' Gross Profit in 1956 was Higher by 34 Per Cent

Bowmans Chemicals

Dividend of Bowmans Chemicals for the year ended 31 October 1956 was 10 per cent, the same as the previous year. Net profit, subject to audit, is £16,622 (£11,611) after tax of £18,644 (£14,696). Gross profit at £35,300 is 34 per cent higher than the previous year. It is thought that this improvement may be partly the result of a long term working agreement negotiated with Howards and Sons in March 1955.

Benn Brothers

Directors of Benn Brothers Ltd., proprietors of CHEMICAL AGE, have declared a dividend, less tax, of 3 per cent (same) on preference for the half year ended 31 December 1956. Dividend of 5 per cent (same) is declared on ordinary stock. Both are payable on 15 February.

Benzole Take-over

Benzole Producers (formerly National Benzole Holdings) have announced that the sale of the motor fuel and lubricants business of the National Benzole Co. and of the shares in their company to Shell-Mex and BP has been completed and the National Benzole Co. has ceased to be a subsidiary. As previously indicated the 5¼ per cent unsecured loan stock, 1963-82, now falls to be redeemed and the company intends to repay the stock on 31 January.

Scottish Agricultural Industries Ltd.

Turnover of Scottish Agricultural Industries for the year ended 30 September was £24.2 million compared with £23.2 in 1955. This was largely due to increased consumption of fertilisers said the chairman, Mr. W. D. Scott, at the annual general meeting in Edinburgh on 17 January.

'You will recall,' said Mr. Scott, 'that on 7 June you (the shareholders) gave us authority to increase the capital of the company, using £826,400 of our capital and revenue reserves. Your directors recommend a final Ordinary dividend of five per cent which with the interim dividend of three per cent, makes eight per cent for the year. Last year the dividend was 11 per cent but this was on the old capital and is equivalent to 7 6/7 per cent on the present increased capital. There has, therefore, been a fractional increase. We have already replaced, out of the year's profits, the sum of £174,191 taken from revenue reserves towards last year's capitalisation.

'Our profits before taxation have gone down by £71,570 from £1,162,945 to £1,091,375, but these are not unsatisfactory when we consider that during the financial year under review our dealings in farmers' grain were reduced as a result of the harvest in 1955 being early and that in 1956 being late'.

Discussing capital expenditures of the past year, Mr. Scott said that they had spent, and would be spending, large sums of money to keep in the forefront of their business. 'When the Leith works was completed it would have cost more than £3 million, by far the largest sum spent on one project since the founding of the company. The Leith factory was being built on a new site and although it would incorporate all the latest techniques of fertiliser manufacture it was still essentially a replacement of existing manufacturing capacity with, of course, sufficient in addition to meet expansion of the market.

Close liaison had been maintained with Imperial Chemical Industries on the latest production techniques, and in addition, members of the company's staff had travelled widely in Europe, in Canada and in the US. The directors were confident that by the summer of this year the company would have in operation, ready to provide fertilisers for the 1957/1958 season, the most economic and up-to-date process for converting insoluble phosphate derived from phosphate rock into the soluble form in which it can be combined with nitrogen and potash to furnish an efficient plant food.

The fertilisers to be made at Leith would be of the same high concentration as those made by ICI at Billingham. Many Scottish farmers were already using fertilisers of this type and, so far, the demand had exceeded the supply, but the new factory would correct this position.

William Briggs and Sons

Net profit of William Briggs and Sons Ltd., Dundee, for year ended 30 September was £152,757 (£153,348). Final ordinary dividend of 17½ per cent, making 25 per cent (same), is proposed and £48,900 (£43,159) is carried forward.

In his annual statement, Mr. John Wooler, chairman, said that the three tar distilling works have operated steadily. Camperdown oil and bitumen refinery has operated at maximum capacity and the entire output of petroleum products has either been sold or absorbed into the company's other manufactures. The enlarged modern vacuum distillation plant refines imported crude oil into a range of petroleum products used by the company or sold at home or abroad.

Union Carbide Purchase

Visking shareholders have approved the purchase of the assets of the Viking Corporation by Union Carbide and Carbon Corporation. Terms of the agreement, previously approved by the directors of Union Carbide, call for the exchange of one share of Union Carbide stock for each two and a half shares of Visking stock currently held. A new division of Union Carbide will be set up, to be known as Visking Company.

Union Carbide's major fields of interest are alloys and metals, carbon products, industrial gases, chemicals, plastics, and nuclear energy. The availability of the research facilities in these fields, coupled with the facilities and technical experience of Visking, is one of the principle reasons for Visking joining Union Carbide.

Visking, founded in 1925, makes food casings and polythene film and tubing for the packaging industry.

United Steel Companies Ltd.

The surplus available for appropriation by United Steel Companies Ltd., owners of United Coke & Chemicals Co. Ltd., and other companies, was £3,581,838 at 30 September, the end of the financial year. To this is added the balance at 1 October 1955, making a total of £4,410,391.

NEW COMPANY

TRI-SIL (CHEMICALS & EQUIPMENT) LTD. Capital £1,000. Manufacturing chemical and general scientific equipment, engineering equipment; engineers, refiners of chemicals and metals, etc. Directors: R. A. Cole, A. Walsh, and M. Peters. Registered office: 79-81 Nile Street, London N1.

INCREASE OF CAPITAL

MATTHEW CARMICHAEL LTD. Manufacturing chemists, etc., 259 Kilmarnock Road, Glasgow. Increased by £2,500 in £1 ordinary shares, beyond the registered capital of £2,500.

CHANGE OF NAME

APEXIA CHEMICAL CO. LTD., 17 Queens Road, Brighton, have changed their name to Frank Broad Ltd.

MORTGAGES & CHARGES

ARNAK PRODUCTIONS LTD. Manchester, plastics manufacturers, etc.—18 December, £9,900 debentures; general charge.

SATISFACTION

HILL BROTHERS GLASS CO. LTD.—Birmingham. Satisfaction 24 December of mortgage registered 21 April 1952.

Brotherton's New Leeds Head Office

NEW HEAD OFFICES of Brotherton and Co. Ltd. in Westgate, Leeds 1, are to be officially opened on 28 January by the Earl of Scarborough in the presence of the Lord Mayor of Leeds and other prominent guests.

The impressive new building in the Westgate development area is seven storeys high and was designed by Mr. Victor Bain, F.R.I.B.A. Floor area totals 40,000 sq. ft. Work was started two years ago and was completed by Christmas 1956. Estimated cost was in the region of £350,000.

BRITISH CHEMICAL PRICES

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abreviations: d/d, delivered; cp, carriage paid; ret, returnable; non-ret. pack, non-returnable packaging; tech, technical; comm, commercial; gran, granular.

General Chemicals

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £91; 80% pure, 10 tons, £97; commercial glacial, 10 tons, £99.

Acetic Anhydride. Ton lots d/d, £132.

Alum. Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s.
MANCHESTER: £15 15s to £18 10s.

Ammonia, Anhydrous. Per lb., 1s 9d to 2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £29 2s 6d.

Ammonium Nitrate. D/d, in 4-ton lots, £31.

Ammonium Persulphate. MANCHESTER: per cwt., in 1-cwt. lots, d/d, £6 2s 6d; per ton, in min. 1-ton lots, d/d, £112 10s.

Ammonium Phosphate. Mono- and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 5d to 4s 10½d; golden, 2s 8½d to 4s 1½d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate (Dry Blanc Fixe). Precip., 2-ton lots, d/d, £35.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £28 12s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £62 10s; gran., £42; crystal, £44 10s; powder, £45 10s; extra fine powder, £46 10s; BP, gran., £51; crystal, £53 10s; powder, £54 10s; extra fine powder, £55 10s.

Boric Acid. Ton lots, in hessian sacks, c.p. Tech., gran., £71; crystal, £79; powder, £76 10s; extra fine powder, £78 10s; BP gran., £84; crystal, £91; powder, £88 10s; extra fine powder, £90 10s.

Calcium Chloride. Ton lots, in non-ret. pack: solid and flake, £16.

Chlorine, Liquid. In ret. 16-17-cwt. drums d/d in 3-drum lots, £38 5s.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 0¾d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £75 16s 8d.

Citric Acid. 1-cwt. lots, per cwt., £10 15s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 3s.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £94 10s.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £37 5s.

Formic Acid. 85%, in 4-ton lots, c.p., £86 10s.

Glycerine. Chem. pure, double distilled 1.260 SG, per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined pale straw industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 59/60%, per lb., about 2s.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 10d; for 1-cwt. lots, per lb., 13s 11d.

Iodoform. Under 1 cwt., per lb., £1 3s 5d.; for 1-cwt. lots, per lb., £1 2s 6d.

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., ex-works, per lb., 9d; chem. quality, 44% by wt., ex-works, per. lb., 12½d; 1-ton lots, usual container terms.

Solvents & Plasticisers

Acetone. All d/d, small lots, 5-gal. cans: 5-gal., £125; 10-gal., cans incl., £115. 40/45 gal. ret. drums, spot: Under 1 ton, £90; 1 to under 5 tons, £87; 5 to under 10 tons, £86; 10 tons under, £85. Tank wagons, spot: 1 to under 5 tons (min. 400 gal.), £85; 5 to under 10 tons (1,500 gal.), £84; 10 tons & up (2,500 gal.), £83; contract rebate, £2.

Butyl Acetate BSS. 10-ton lots, £165.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £152.

***sec*-Butyl Alcohol.** 5-gal. drums, £159; 40-gal. drums: under 1 ton, £124; 1-10 tons, £123; 10 tons & up, £119; 100 tons & up, £120.

***tert*-Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons & up, £712 10s.

Diacetone Alcohol. Small lots: 5-gal. drums, £177; 10-gal. drums, £167. 40/45-gal. drums: under 1 ton, £142; 1-9 tons, £141; 10-50 tons, £140; 50-100 tons, £139; 100 tons & up, £138.

Dibutyl Phthalate. In drums, 10 tons, d/d, per lb., 2s; 45-gal. drums, d/d, per lb., 2s 1½d.

Diethyl Phthalate. In drums, 10 tons, per lb., 1s 11½d; 45-gal. drums, d/d, per lb., 2s 1d.

Dimethyl Phthalate. In drums, 10 tons, per lb., d/d, 1s 9½d; 45-gal. drums, d/d, per lb., 1s 10¾d.

Dioctyl Phthalate. In drums, 10 tons, d/d, per lb., 2s 8d; 45-gal. drums, d/d, per lb., 2s 9½d.

Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.

Ethyl Acetate. 10-ton lots, d/d, £135.

Ethyl Alcohol (PBS 66 o.p.). Over 300,000 p. gal. 2s 11½d; d/d in tankers, 2,500-10,000 p. gal., per p. gal., 3s 1½d. D/d in 40/45-gal.drums, p.p.g. extra, 1d. Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.

Methanol. Pure synthetic, d/d, £43 15s.

Methylated Spirit. Industrial 66° o.p.: 500-gal. & up, d/d in tankers, per gal., 5s 4d; 100-499 gal. in drums, d/d, per gal., 5s 8½d. Pyridinised 64 o.p.: 500 gal. & up, in tankers, d/d, per gal., 5s 6d; 100-499 gal. in drums, d/d, per gal., 5s 10½d.

Methyl Ethyl Ketone. 10-ton lots, d/d, £140.

Methyl *iso*Butyl Ketone. 10 tons & up, £159.

***iso*Propyl Acetate.** In drums, 10 tons, d/d, £130; 45-gal. drums, d/d, £136.

***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40-45 gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons & up, £80.

Rubber Chemicals

Carbon Disulphide. According to quality, £61-£67.

Carbon Black. Per lb., according to packing, 8d-1s.

Carbon Tetrachloride. Ton lots, £81.

India-Rubber Substitutes. White, per lb., 1s 6½d-1s 10½d; dark, d/d, per lb., 1s 3d-1s 5½d.

Lithopone. 30%, about £55.

Mineral Black. £7 10s-£10.

Sulphur Chloride. British, about £50.

Vegetable Lamp Black. 2-ton lots, £64 8s.

Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

Coal-Tar Products

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 6s; pure, 6s 4d.

Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s.
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s.

Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s-1s 8d.

Cresylic Acid. Pale 99/100%, per gal., 6s 4d; 99.5/100%, per gal. 6s 6d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 3d; per US gallon, c.i.f. NY, 95 cents.

Naphtha. Solvent, 90/160°, per gal., 6s 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 4s 11d. Drums extra; higher prices for smaller lots.

Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £20 11s-£33 11s 6d; hot pressed, bulk, ex-works, £40 1s 9d; refined crystals, d/d min. 4-ton lots, £68.

Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £9; export trade, f.o.b. suppliers' port, about £10 10s.

Pyridine. 90/160, per gal., 20s-£1 2s 6d.

Toluole. Pure, per gal., 6s 9d; 90's, d/d, 2,000 gal. in bulk, per gal., 6s.
MANCHESTER: Pure, naked, per gal., 6s 7½d.

Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 7s-7s 8d.

Intermediates & Dyes
(Prices Nominal)

***m*-Cresol** 98/100%. D/d, per lb., 4s 9d.

***o*-Cresol** 30/31°C. D/d, per lb., 1s.

***p*-Cresol** 34/35°C. D/d, per lb., 4s 9d.

Dichloraniline. Per lb., 4s 6d.

Dinitrobenzene. 88/99°C., per lb., 2s 1d.

Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.

***p*-Nitraniline.**—Per lb., 5s 1d.

Nitrobenzene. Spot, 90-gal. drums (drums extra), 1-ton lots d/d, per lb., 10d.

Nitronaphthalene.—Per lb., 2s 5½d.

***o*-Toluidine.** 8-10-cwt. drums (drums extra), per lb., 1s 11d.

***p*-Toluidine.**—In casks, per lb., 6s 1d.

Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £147; orange lead, £157. Ground in oil: red, £162 15s; orange, £174 15s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £149 15s. Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d. £40; grey, 80-82%, ton lots, d/d, £45.
Litharge. In 5-ton lots, £147.
Magnesite. Calcined, in bags, ex-works, about £21.
Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10ss under 2 tons, £97.
Magnesium Chloride. Solid (ex-wharf), £16 10s.
Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.
Magnesium Sulphate. Crystals, £16.
Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 3s; smaller quantities dearer.
Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 9s 3d.
Nickel Sulphate.—D/d, buyers UK, nominal, £170.
Nitric Acid. 80° Tw., £35.
Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £131.
Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb., 1s 4d.
Potash, Caustic. Solid, 1-ton lots, £93 10s; liquid, £34 15s.
Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.
Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.
Potassium Dichromate. Crystals and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 1½d.
Potassium Iodide. BP, under 1-cwt., per lb., 11s 2d; per lb. for 1-cwt. lots, 10s 8d.
Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.
Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 10½d; 3-cwt. lots, per lb., 1s 10d; 5-cwt. lots, per lb., 1s 9½d; 1-ton lots, per lb., 1s 9¼d; 5-ton lots, per lb., 1s 8¾d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 8s 6d; 1-cwt. lots, £9 17s 6d.
Salammoniac. Ton lot, in non-ret. pack, £45 10s.
Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 8½d.
Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £16 8s.
Soda, Caustic. Solid 76/77%: spot, d/d 4-ton lots, £32 6s 6d.
Sodium Acetate. Comm. crystals, d/d, £91.
Sodium Bicarbonate. Ton lot, in non-ret. pack, £17.
Sodium Bisulphite. Powder, 60/62%, d/d, 2-ton lots for home trade, £42 15s.
Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £57.
Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £85.
Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £113 5s.
Sodium Dichromate. Crystals, cake and powder, per lb., 11¼d. Net d/d UK, anhydrous, per lb., 1s 1d. Net. del. d/d UK, 5-cwt. to 1-ton lots.
Sodium Fluoride. D/d, 1-ton lots & over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.
Sodium Hyposulphite. Pea crystals, £35 15s; comm., 1-ton lots, c.p., £32 10s.
Sodium Iodide. BP, under 1 cwt., per lb., 15s 1d; 1-cwt. lots, per lb., 14s 2d.
Sodium Metaphosphate (Calgon). Flaked, paper sacks, £133.
Sodium Metasilicate. D/d UK in ton lots, loaned bags, £25.
Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d station, £29 10s.
Sodium Nitrite. 4-ton lots, £32.
Sodium Percarbonate. 12½% avaiable oxygen, per cwt., in 1-cwt. kegs, £8 6s 9d.
Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.
Sodium Silicate. 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £10 15s; Dorset, Somerset & Devon, per ton extra, £3 17s 6d; Scotland & S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.
Sodium Sulphate (Desiccated Glauber's Salts). D/d in bags, £18.
Sodium Sulphate (Glauber's Salt). D/d, £9 5s to £10 5s.
Sodium Sulphate (Salt Cake). Unground, d/d station in bulk, £6.
MANCHESTER: d/d station, £7 10s.
Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £33 2s 6d; broken, d/d, in drums in 1-ton lots, £34 2s 6d.
Sodium Sulphite. Anhydrous, £66 5s; comm., d/d station in bags, £25 5s-£27.
Sulphur. 4 tons or more, ground, according to fineness, £20-£22.
Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 7s 6d-£12; 140° Tw., arsenic free, £8 12s 6d; 140° Tw., arsenious, £8 4s 6d.
Tartaric Acid. Per cwt.: 10 cwt. or more, £13 10s; 1 cwt., £13 15s.
Titanium Oxide. Standard grade comm., rutile structure, £182; standard grade comm., anatase structure, £167 (from 1st Feb.).
Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £120; green seal, £113; red seal, 2-ton lots, £115.

Chemical Stocks and Shares

MARKET RESPONDS TO HOPES OF EASIER MONEY POLICY

GROWING hopes of a reduction in the bank rate, the assumption that the new Macmillan government favours a cheaper money policy and talk of easing of the credit squeeze and HP restrictions later in the year, have inspired a general advance in stock markets. The advance was led by British Funds, War Loan 3½ per cent, for example, having risen by £5 to £74¼ compared with a month ago, while leading industrial shares showed many substantial gains.

The stock market advance is largely technical, as it is based on hopes of a lower bank rate and cheaper money, but it is also a reflection of increased confidence arising from the new government. The advance in share prices does not indicate the belief that higher dividends are in prospect. On the contrary, it is known that in most industries rising costs, which have received a big stimulus from the increase in oil and petrol prices, are reducing profit margins. Nevertheless, although profits may be lower, it is widely believed that the majority of dividends should be maintained, and on this basis numerous shares would still offer not unattractive yields.

A big feature of markets has been the outstanding success of Imperial Chemical's issue of £40,000,000 of 5½ per cent convertible loan stock, which was oversubscribed nearly six times, and since dealings started has established a premium of more than £8 over the issue price of £96. There has been considerable selling in order to cash in on the premium, but this was followed by heavy buying by investors who regard the stock as having valuable prospects because from 1958 it will be convertible into ICI ordinary shares, on a basis which could then be very attractive indeed. Compared with a month ago ICI shares have moved up from 38s 10½d to 41s. There is general confidence that ICI dividend for the year will be maintained; very few in the City expect an increase at this stage.

Chemical shares generally moved higher under the stimulus of the upward trend in stock markets. Fisons, for instance, at 54s 6d compared with 47s 6d a month ago, and Hickson & Welch 10s shares have been good with an advance from 32s to 33s 9d. Laporte 5s shares rose from 16s to 18s 6d and Reichhold 5s shares were 15s 6d as compared with 13s 3d a month ago. Monsanto 5s shares have been steady at 23s 7½d, Hardman and Holden rose on the month from 8s xd to 9s and F. W. Berk were well maintained at 6s 10½d. Rise in Bowmans Chemicals' net profits from £11,611 to £16,622 and the maintained 10 per cent dividend created a good impression. The 4s shares were firm at 5s.

There has been considerable activity in Borax Holdings shares since the free scrip issue and the 'splitting' of the £1 shares into 5s shares. Sentiment was also helped by news of expansion in the group's research activities, but the 5s shares at 23s 9d have not quite held best levels. Greeff-Chemicals 5s shares changed hands around 16s 9d and William Blythe 3s shares around 10s while Albright & Wilson 5s shares were well maintained at 18s. Moreover, Anchor Chemicals 5s shares kept at 11s 6d. A rise from 9s to 10s was recorded in British Chrome Chemicals 5s shares and Ashe Chemical 1s shares strengthened from 10½d to 1s 1½d. Coalite & Chemical 2s shares have firmed up to 4s and Willows Francis 2s 6d shares were 4s 1½d, the same as month ago. Brotherton 10s shares eased from 23s 9d to 21s 10½d, while in other directions, British Glues and Chemicals 4s shares have advanced to 11s 9d xd, a rise of 1s 3d on the month.

The rising trend extended to plastics shares with British Xylonite at 28s against 25s 3d a month ago. British Industrial Plastics 2s shares moved up from 4s 7½d to 4s 10½d xd. Lawes Chemicals strengthened from 16s 3d to 17s 6d.

Elsewhere, the 6s 8d units of the Distillers Co. were 23s, compared with 21s 9d. Triplex Glass 10s shares have moved up from 29s 1½d to 30s 7½d. Boots Drug 5s shares held firm at 15s and British Drug Houses 5s shares gained 6d at 13s 6d. Glaxo 10s shares were firm at 24s.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London, WC2, price 2s 6d including postage; annual subscription £6 6s.

Specifications filed in connection with the applications in the following list will be open to public inspection. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period. Date on which these applications will be open to inspection are given in 'Official Journal (Patents)'.

AMENDED SPECIFICATIONS PUBLISHED

630 631 Flocculation of sewage suspensions and sludges. Spence, P., & Sons Ltd., and others.

687 838 Stripping catalysts and apparatus therefor. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij.

726 848 Ammonium citrate soluble fertiliser, mainly secondary calcium phosphate. Osterreichische Stickstoffwerke AG.

731 129 Preparing alkyl phenol sulphides. Standard Oil Development Co.

ACCEPTANCES

766 866 Synthetic resin dispersions. Celastic Corp.

766 429 Polyvinyl chloride resins. United States Rubber Co.

766 528 Organosilicon compounds. Midland Silicones Ltd.

766 324 Tetrafluorethylene. Du Pont de Nemours & Co.

766 870 Anaesthetic agents. [Divided out of and addition to 764 958.] Cassella Farbwerke Mainkur AG.

766 328—766 329 Penicillin salts of esters of 4-aminosalicylic acid. (Divided out of 766 327.) [Addition to 766 325.] Rheinpreussen AF Fuer Bergbau und Chemie.

767 093 Ketones from secondary alcohols. Institut Francais du Petrole des Carburants et Lubrifiants.

767 002 Thickened lubricating oils. California Research Corp.

767 004 Vat dyestuffs of the anthraquinone series. Cassella Farbwerke Mainkur AG.

766 875 Organo-substituted stannane derivatives. Carlisle Chemical Works Inc.

767 290 Aliphatic carboxylic acids. Distillers Co. Ltd.

766 876 Manufacture of benzene and of alkyl benzenes. Ziegler, K.

767 180 Steroid compounds. Pfizer & Co. Inc.

766 877 Continuous vacuum distillation of metals. Broken Hill Associated Smelters Pty. Ltd.

767 100 1, 3, 5-Ethyl xylene, meta xylene, ethylbenzene and benzene. Standard Oil Co.

767 103 Electrolytic production of weak acids. Rohm & Haas Co.

767 017 Diisocyanate-modified polyesters, polyesteramides and polyethers. Imperial Chemical Industries Ltd.

767 298 Iron biscyclopentadienyl alkyl and acyl and derivatives. California Research Corp.

767 203 Nylon. General Electric Co.

767 018 Liquid hydrocarbon fuels and additives. Ethyl Corp.

767 204 Ammonium sulphate. Bahr, J. W. K. F.

767 019 Aldehyde condensates monohydrocarbon-substituted m-isopropylphenol. Firestone Tire & Rubber Co.

766 885 Ceramic materials. UK Atomic Energy Authority.

767 115 Metal salts of phenolic compounds containing sulphur. Esso Research & Engineering Co.

767 117 Dyeing fibres of polyacrylonitrile. Ciba Ltd.

766 887 Purification of salicylic acid etc. Monsanto Chemicals Ltd.

767 024 Polyoxyalkylene ethers of heterocyclic amides and esters. Atlas Powder Co.

767 025 Polyamide fibres with per-compounds or per-compound containing detergent compositions. Deutsche Gold- und Silberscheideanstalt Vorm. Roessler.

767 306 Shaped elastomers from isocyanate modified polymers. Dunlop Rubber Co. Ltd.

767 122 Removal of vanadium and/or sodium from petroleum hydrocarbons. British Petroleum Co. Ltd.

767 027 Thiosalicylhydrazide, dithiosalicylhydrazide and their derivatives. Schenley Industries Inc.

766 992 Heparin. Boots Pure Drug Co. Ltd.

767 125 Regeneration of catalysts. British Petroleum Co. Ltd.

767 312 Cracking hydrocarbons. Esso Research & Engineering Co.

767 127 Indicating volatile combustible liquid in mixture containing said liquid. British Petroleum Co. Ltd.

767 314 Solutions of acetone-soluble copolymer of acrylonitrile and vinylidene chloride. British Celanese Ltd.

766 894 Hydrogenated petroleum resins. Esso Research & Engineering Co.

767 033 Polymerisation process. Esso Research & Engineering Co.

767 037 Polyformals. Esso Research & Engineering Co.

767 038 Extraction of niobium. UK Atomic Energy Authority.

767 135 Separation of niobium from tantalum. UK Atomic Energy Authority.

767 216 Purine derivatives. Wellcome Foundation Ltd.

767 317 Piperazine adipate. British Drug Houses Ltd.

767 223 Agents for improving the stability of rubber mixtures. Chemische Werke Huls AG.

767 141 Thiazole derivatives. May & Baker Ltd.

767 041 Acetylenic carboxylic acids. Wolf, V.

766 908 Separating oil and water. Silley, H. A. J., and Unthank, D.G.

767 042 Oil-soluble basic calcium sulphonates. Esso Research & Engineering Co.

767 143 Beta-naphthol. Sterling Drug Inc.

767 224 Emetine. Whiffen & Sons Ltd.

767 225 Pest control agents and phosphonic acid esters. Geigy AG.

767 088—767 089 Fluorocarbon compounds. Minnesota Mining & Manufacturing Co.

767 148 Acetanilide derivatives. Boots Pure Drug Co. Ltd.

766 912 Continuous polycondensation of ethylene glycol diester of terephthalic acid in organic solvents. Vereinigte Glanzstoff-Fabriken AG.

766 913 Separation of isomeric menthane dicarboxylic acids. Ruhrchemie AG.

767 151 Synthetic ester lubricants. Esso Research & Engineering Co.

767 152 Improving fastness of dyeings with substantive dyestuffs on fibrous materials. Farbenfabriken Bayer AG.

767 153 Stable oral penicillin suspensions. Bristol Laboratories Inc.

767 226 Hardening silicone resins. Wacker-Chemie Ges.

767 053 Dyeing polyacrylonitrile textile materials. Sandoz Ltd.

767 156 Separation of nickel from cobalt. Soc. Generale Metallurgique de Hoboken.

766 923 Mixed fertilisers of basic slag and potassium salts. Wintershall AG.

767 230 Sulphur and sulphur dioxide recovery from sulphide ores. Duisburger Kupferhütte.

766 925—767 344 Melamine and/or cyanamide production. [Addition to 718 934.] American Cyanamid Co.

767 231 Gas filters. Ozonair Engineering Co. Ltd.

766 927 Linear superpolymers of mixed diamines. California Research Corp.

767 347 Naphthalene. Esso Research & Engineering Co.

767 348 Adipic acid. Du Pont de Nemours & Co.

766 994—766 995 Crystallisation of insulin. Novo Terapeutisk Laboratorium Aktieselskab.

767 360—767 361 Oxygenated steroid compounds. Merck & Co. Inc.

766 945 Preparation of reaction products of chlorine water with other substances. Wessanen's Koninklijke Fabrieken NV.

767 162 Polyamino polycarboxylic acid chelating agents. Refined Products Corp.

767 246 4-Aralkyl-3-morpholones and 4-aralkyl-3-homomorpholones. Sterling Drug Inc.

767 163 5:6-dihydrobenzo (c) cinnoline derivatives. Haco Ges AG.

767 369 Acetylene by incomplete combustion of hydrocarbons with oxygen. Badische Anilin- & Soda-Fabrik AG.

767 068 Adhesive compositions with synthetic resins. [Addition to 756 269.] United States Rubber Co.

767 374 Tetraesters of pyrophosphoric acid. Union Carbide & Carbon Corp.

766 993 Production of heparin. [Divided out of 766 992.] Boots Pure Drug Co.

766 968 Xylenes. Stamicarbon NV.

767 254 Rubber vulcanisation. Chemische Werke Hüls AG.

767 073 Pharmaceutical radioactive capsules. Abbott Laboratories.

766 976 Exothermic catalytic reactions under high pressure. [Addition to 722 948.] Montecatini Soc. Generale per L'Industria Mineraria e Chimica.

767 385 Hardenable liquid resins. [Addition to 720 035.] Badische Anilin- & Soda-Fabrik AG.

767 186 — 767 187 Polychlorophenols. Diamond Alkali Co.

767 388 Acetaldehyde from acetylene. Taoka Dyestuff Manufacturing Co. Ltd.

767 181 Derivatives of ergosterol. [Divided out of 767 180.] Pfizer & Co. Inc.

767 681 Rubber and rubber-asphalt compositions. Wingfoot Corp.

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767 801 Branched-chain condensation polymers. British Celanese Ltd.
767 393 Concentrated preparations of hormone for injection. [Addition to 741 656.] Schering AG.
767 394 Copolyesters. Du Pont de Nemours & Co.
767 712 Catalytic hydrogenation of carbon monoxide. Ruhrchemie AG, and Lurgi Ges. Fuer Waermetechnik.
767 565 Preserving poultry, especially ducklings. Bölts, R.
767 503 Fermentation apparatus. APV Co. Ltd.
767 585 Fibrous materials, water-repellent. Farbwerke Hoechst AG.
767 820 Finely divided or flocculent superpolyamide compositions. Glacier Metal Co. Ltd.
767 654 Hydrolysing organic-silicon compounds. [Addition to 740 534.] Wacker-Chemie Ges.
767 400 Trialkylaluminium compounds. Ziegler, K.
767 587 Refining petroleum fractions. Compagnie Francaise de Raffinage.
767 821 Ion exchange resins. National Research Development Corp.
767 806 Organic sulphur compounds. Boots Pure Drug Co. Ltd.
767 824 Dermatological preparations. Organon Laboratories Ltd.
767 588 Substituted pyrimidines. Boots Pure Drug Co. Ltd.
767 826 Piperazine adipate compositions. British Drug Houses Ltd.
767 592 Refining hydrocarbon oils. Esso Research & Engineering Co.
767 509 Preservation of meat. Sharp, J. G.
767 829 Epoxide-containing ester adhesives. Henkel & Cie Ges.
767 593 Thermoset resin-surfaced laminates. American Cyanamid Co.
767 409 Ketones. Imperial Chemical Industries Ltd.
767 722 Petroleum jelly. British Petroleum Co. Ltd.
767 578 Elastomeric polyisocyante modified polyesters and polyesteramides. Imperial Chemical Industries Ltd.
767 434 Organopolysiloxane moulding compositions. Soc. des Usines Chimiques Rhone-Poulenc.
767 580 Sulphuric acid ester salts of leuco vat dyestuffs of the anthraquinone series. [Addition to 719 621.] Durand & Huguenin AG.
767 595 Anthraquinone vat dyestuffs. Ciba Ltd.
767 596 Fatty acid salts of polyalkylol polyalkylene polyamine compounds. [Addition to 738 529.] Dow Chemical Co.
767 440 Fluorine-containing polymers. Kellogg Co.
767 725 Lactams. Farbwerke Hoechst AG.
767 599 Fungicidal compositions. Boots Pure Drug Co. Ltd.
767 600 Vitamin supplements for animal feeds. Rosenberg, A.
767 729 Emulsion paints. Distillers Co. Ltd.
767 601 Metal alcoholates. Hardman & Holden Ltd., and Rinse, J.
767 839 Vaccines. Mendoza, R. S.
767 840 Ointments, skin creams and liniments. Dehydag Deutsche Hydrierwerke Ges.
767 603 Sweetening of mercaptan-containing petroleum and other hydrocarbons. British Petroleum Co. Ltd.
767 738 Hydrocarbon oil compositions. Monsanto Chemical Co.
767 448 Greases containing dihydroxy stearic acid soaps. Esso Research & Engineering Co.
767 605 Hydroforming. Esso Research & Engineering Co.
767 449 Separating solutes having different degrees of ionisation. Dow Chemical Co.
767 664 Pyridoxin- or riboflavin-phosphometallic compounds. Padula, P.
767 845 Vinyl acetate resin compositions. Imperial Chemical Industries Ltd.
767 747 Plasticised polyvinyl halide compositions. Cabot Inc.
767 748 Pesticidal compositions. Price, M. D.
767 412 Anthraquinone vat dyestuffs. Ciba Ltd.
767 749—767 848 Triazine derivatives. Imperial Chemical Industries Ltd.
767 849 Antibacterials containing antibiotic 160-7. Merck & Co. Inc.
767 751 Hydrogen peroxide and ethylene oxide from ethane. National Research Corporation.
767 810—767 811 Treatment of cotton products to improve their tensile strength. Institute of Textile Technology.
767 752 Treatment of growth media. Dow Chemical Co.
767 667 Integrated hydrofining process. Esso Research & Engineering Co.
767 615 Peroxidic compounds. Distillers Co. Ltd.
767 699 — 767 700 — 767 701 — 767 702 Photographic developer compositions. Kodak Ltd.
767 705 Photographic developing agents. Kodak Ltd.
767 754 Halogenated naphthoquinone-imines. Sandoz Ltd.
767 851 Nonionic surface active agents. Union Carbide & Carbon Corp.
767 617 Acid-resistant cementitious products. Semtex Ltd.
767 757 Polymerising chlorotrifluoroethylene. Union Carbide & Carbon Corp.
767 414 Rabies vaccine. American Cyanamid Co.
767 761 Anhydrous calcium silicates. Owens-Illinois Glass Co.
767 416 Oxidising glutaraldehyde. Union Carbide & Carbon Corp.
767 417 Polymerisation of ethylenically unsaturated compounds. Bakelite Ltd.
767 764 Weedkillers. Chipman Chemical Co. Ltd.
767 853 Preparation for preventing vomiting. Kinney & Co. Inc.
767 807 Acaricidal compositions comprising benzylthiobenzthiazole. [Divided out of 767 806.] Boots Pure Drug Co. Ltd.
767 421 Unsaturated polyesters and copolymers. Soc. des Usines Chimiques Rhone-Poulenc.
767 771 Treatment of textile materials for improved antistatic and elastic properties. Lanolized Inc.
767 772 Phosphorus- and sulphur-containing organic compounds. Bochme Fettchemie Ges.
767 422 17-Ketosteroids. Upjohn Co.
767 423 C-tricyanovinyl compounds. Du Pont de Nemours & Co.
767 775 Alumina. Esso Research & Engineering Co.
767 777 Composition for trichuris infection. Allied Laboratories Inc.
767 779 Halohydrocarbon. Imperial Chemical Industries Ltd.
767 780 Trans N-carbamylamic esters. United States Rubber Co.
767 428 Highly refined petroleum oils. Esso Research & Engineering Co.
767 552 Apparatus for dispensing chlorine dioxide. Cardox Corp.
767 430 Bisazo dyestuffs. Compagnie Francaise des Matieres Colorantes.
767 788 Polyiodinated phenyl fatty acid compounds. Schering Corp.
767 629 Preparation of sodium bicarbonate and ammonium sulphate. Naamlooze Vennootschap Koninklije Nederlandsche Zoutindustrie.
767 630 Purification and separation of B_{12}-group vitamins. Aschaffenburger Zellstoffwerke AG.
767 790 Amino diols and intermediates. Parke, Davis & Co.
767 878 Aminoacid esters. Yoshitomi Pharmaceutical Industries Ltd.
767 679 Aminoacid amides. Yoshitomi Pharmaceutical Industries Ltd.
767 680 Aminoacids. Yoshitomi Pharmaceutical Industries Ltd.
767 634 Herbicides and herbicidal compositions comprising urea derivatives. Allied Chemical & Dye Corp.
767 879 Temperature, oxidation and corrosion resisting material. Metro-Cutanit Ltd.
767 636 Alkali metal perpyrophosphate of low bulk weight. Chemische Fabrik Budenheim AG.
767 792 Purification of chlorine. Diamond Alkali Co.
767 450 Chromium-containing monoazo dyestuffs. Farbenfabriken Bayer AG.
767 451 Centrifuge for separating liquids from granular material. AG für Unternehmungen der Eisen- und Stahlindustrie.
767 452 Heterocyclic sulphonamides. American Cyanamid Co.
767 638 Insecticides. Minister of Defence of Canada.
767 639 Refining of polythene. Monsanto Chemical Co.
767 794 Aqueous chlorine dioxide antiseptic compositions. Chemical Associates Inc.
767 455 Synthetic esters as lubricants. Eastman Kodak Co.
767 459 Drying atomised wet material and separating dried material. Sulzer Freres SA.
767 463 Phthalic acids by oxidation of dialkyl benzenes. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij.
767 642 Styrene-type polymers. Monsanto Chemical Co.
767 465 Cellular structure in vinyl ester resin. Elastomer Chemical Corp.
767 888 Surface treatment of aluminium and its alloys. American Chemical Paint Co.
767 468 Discharging carbon dioxide containers. Specialties Development Corp.
767 671 Dextran-splitting enzyme by cultivations of *Aspergillus wentii*. Commonwealth Engineering Co. of Ohio.
767 644 Vatting of vat dyestuffs. Badische Anilin- & Soda-Fabrik AG.
767 892 Zirconium alloys. Thomas, D. E., Goldman, K. M., Gordon, R. B., and Johnson, W. A.
767 472 Correcting profile of extruded section. Dow Chemical Co.
767 897 Delustering of shaped polyamide structures. Du Pont de Nemours & Co.
767 476 Styrene copolymers. Canadian Industries (1954) Ltd., and Du Pont Co. of Canada Ltd.
767 646 Removal of fine or light particles from mixtures of particles. Smidth & Co. Aktieselskab.
767 797 Organopolysiloxane adhesive compositions. Midland Silicones Ltd.
767 559 Ditolyl methane. Stamicarbon NV.
767 673 W-monochloro-isopropyl n-(3-chlorophenyl)-carbamate and herbicidal preparations containing it. Food Machinery & Chemical Corp.
767 651 4-Sulphonyl derivatives of salicylic acid. Farbenfabriken Bayer AG.

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